National Library
of Canada

Acquisitions and
Bibliographic Services Branch

395 Wellington Street
Ottawa, Ontario
K1A 0N4

Bibliothèque nationale
du Canada

Direction des acquisitions et
des services bibliographiques

395, rue Wellington
Ottawa (Ontario)
K1A 0N4

Your file Votre référence

Our file Notre référence

NOTICE

The quality of this microform is heavily dependent upon the quality of the original thesis submitted for microfilming. Every effort has been made to ensure the highest quality of reproduction possible.

If pages are missing, contact the university which granted the degree.

Some pages may have indistinct print especially if the original pages were typed with a poor typewriter ribbon or if the university sent us an inferior photocopy.

Reproduction in full or in part of this microform is governed by the Canadian Copyright Act, R.S.C. 1970, c. C-30, and subsequent amendments.

AVIS

La qualité de cette microforme dépend grandement de la qualité de la thèse soumise au microfilmage. Nous avons tout fait pour assurer une qualité supérieure de reproduction.

S'il manque des pages, veuillez communiquer avec l'université qui a conféré le grade.

La qualité d'impression de certaines pages peut laisser à désirer, surtout si les pages originales ont été dactylographiées à l'aide d'un ruban usé ou si l'université nous a fait parvenir une photocopie de qualité inférieure.

La reproduction, même partielle, de cette microforme est soumise à la Loi canadienne sur le droit d'auteur, SRC 1970, c. C-30, et ses amendements subséquents.

Canada

UNIVERSITY OF ALBERTA

SCREENING FOR ATTENTION PROBLEMS IN A REGULAR SCHOOL SETTING: DISCRIMINATION OF PSYCHOMETRIC INSTRUMENTS

BY

VERONICA SOLOMAN

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF EDUCATION

IN

SCHOOL PSYCHOLOGY

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

EDMONTON, ALBERTA

FALL, 1993

National Library of Canada

Acquisitions and Bibliographic Services Branch

395 Wellington Street
Ottawa, Ontario
K1A 0N4

Bibliothèque nationale du Canada

Direction des acquisitions et des services bibliographiques

395, rue Wellington
Ottawa (Ontario)
K1A 0N4

Your file Votre référence

Our file Notre référence

The author has granted an irrevocable non-exclusive licence allowing the National Library of Canada to reproduce, loan, distribute or sell copies of his/her thesis by any means and in any form or format, making this thesis available to interested persons.

L'auteur a accordé une licence irrévocable et non exclusive permettant à la Bibliothèque nationale du Canada de reproduire, prêter, distribuer ou vendre des copies de sa thèse de quelque manière et sous quelque forme que ce soit pour mettre des exemplaires de cette thèse à la disposition des personnes intéressées.

The author retains ownership of the copyright in his/her thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without his/her permission.

L'auteur conserve la propriété du droit d'auteur qui protège sa thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

ISBN 0-315-88124-0

Canada

THE UNIVERSITY OF ALBERTA

RELEASE FORM

NAME OF AUTHOR:

TITLE OF THESIS: SCREENING FOR ATTENTION PROBLEMS IN A REGULAR SCHOOL SETTING: DISCRIMINATION OF PSYCHOMETRIC INSTRUMENTS

DEGREE: MASTER OF EDUCATION

YEAR THIS DEGREE GRANTED: FALL, 1993

PERMISSION IS HEREBY GRANTED TO THE UNIVERSITY OF ALBERTA LIBRARY TO REPRODUCE SINGLE COPIES OF THIS THESIS AND TO LEND OR SELL SUCH COPIES FOR PRIVATE, SCHOLARLY OR SCIENTIFIC RESEARCH PURPOSES ONLY.

THE AUTHOR RESERVES OTHER PUBLICATION RIGHTS, AND NEITHER THIS THESIS NOR EXTENSIVE EXTRACTS FROM IT MAY BE PRINTED OR OTHERWISE REPRODUCED WITHOUT THE AUTHOR'S WRITTEN PERMISSION.

Veronica Soloman
Box 152,
Westlock, Alberta
T0G 2L0

Date: June 17, 1993

UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled "Screening for Attentional Problems in a Regular School Setting: Discrimination of Psychometric Instruments", submitted by Veronica Soloman in partial fulfillment of the requirements for the degree of Master of Education.

.....
Supervisor

.....

.....

Date: May 13, 1993

ABSTRACT

Teachers need a simple rating scale to screen children in their class who may have attentional problems, without being obviously hyperactive. One of the major objectives of this study was to try out a rating scale, the Attention Checklist (ACL), on a sample of regular class children in elementary school. The other objective concerned the performance of children on certain objective measures of attention given to them individually. The children were rated as good or poor attenders by the teachers on the ACL.

In the first study, teachers completed the Attention Checklist (ACL) for 110 grade four children from three school districts in rural settings. For each of the 110 children, two teachers independently completed the Attention Checklist. Factor analytic results showed that the ACL items loaded on a single factor that was attention. Together, the 12 items in the ACL explained 82% of the variance. The scale was found to have a high inter-rater correlation of .75 in spite of the fact that some 12 teachers were rating various classes of children.

In the second study, the individually given attention measures were taken from two sources. The students completed tasks from a battery, the Cognitive Assessment System, which provided measures of Expressive Attention, Receptive Attention, Visual Selective Attention, and

Auditory Selective Attention. As well, the WISC-III subtests of Coding and Symbol Search which comprise the Perceptual Speed Index, and, Arithmetic and Digit Span which comprise the Freedom From Distractibility Index were administered.

The results showed that teacher-rated good and poor attenders were significantly separated on their performance on most of the attention tests as well as on all of the WISC-III subscales which were administered. Thus these findings validate the teachers' ratings of attention in the classroom. The study supports the usefulness of the ACL. It also provides a list of objective tests of attention that a school psychologist may give for an in-depth examination of the attentional problems of children following the teachers screening.

Acknowledgements

I wish to express my appreciation to my supervisor, Dr. J. P. Das, for his guidance, support and generous patience throughout this project. I am also deeply indebted to Dr. Rama Mishra, who generously shared his expertise and time.

I would like to extend my thanks to the following school districts and the principals of the participating schools: Westlock School Division No. 37 (Westlock Elementary School); Westlock Roman Catholic Separate School District (St. Mary School); and Legal School District (Legal School), for allowing me to contact their students and parents. I am deeply indebted to the teachers who completed the Attention Checklist and allowed me to meet with children from their classes. Thank you to the children and parents who so generously cooperated.

Table of Contents

Chapter

I Introduction 1

The Problem 1

Context of the problem 1

The purpose of the research 6

Definition of terms 6

Hypotheses 7

Overview of the Chapters 8

2 Review of Related Literature and Research.....9

The Developing Understanding of Attention Deficit Disorder

History 9

Definition 12

Frontal lobe dysfunction 12

ADD with and without hyperactivity 15

Overview 20

The Developing Means of Identifying ADHD

Assessment 31

Tasks 31

Rating scales 33

Continuous Performance Index 34

Multiple Measures 37

CHAPTER

2(cont)

The Impact of Attention Deficit Disorder

Reading 39

Social 40

Treatment

Introduction 43

Medication 44

Limitations of Medication 49

Cognitive Training 52

Therapies 54

Multiple Treatment Methods 56

Summary 59

3 Review of the Literature: Attention Checklist and Cognitive Assessment System 61

Attention Checklist 61

Cognitive Assessment System 69

4 Study One - Validation of the Attention Checklist as a Screening Device for a Regular School Group

Introduction 72

Method 73

Subjects 73

Test 75

Procedure 76

Results and Discussion.....77
Attention Checklist Range of Results 77
Factor Analysis 77
Group Differences 80
Inter-rater Correlations 82
Comparisons with Previous Studies 85
Melnyk (1988) 85
Das, Snyder, Mishra (1992) 87
Summary and Conclusions of Study One 91
5 Study Two - Performance Measures of Attention and Their Relation to the ACL 93
Introduction 93
Method of selection of subjects 93
Tasks: The Cognitive Assessment System.....94
Expressive Selective Attention 95
Receptive Selective Attention 96
Visual Selective Attention 97
Auditory Selective Attention 98
Tasks: Wechsler Intelligence Scale for Children - Third Edition (WISC-III) 98
Perceptual Speed Index 98
Freedom from Distractibility Index 99
Procedure 99

Results and Discussion 100
Expressive Selective Attention 100
Receptive Selective Attention 102
Visual Selective Attention 106
Auditory Selective Attention 108
WISC-III Tasks 112
Comparison to Previous Studies 111
Das, Snyder, Mishra (1992) 114
Summary and Conclusion of Study Two 116
6 Conclusion 118
References.....124

APPENDIX A: The Attention Checklist and key.....143
APPENDIX B: Expressive attention tasks 144
APPENDIX C: Receptive attention tasks 145
APPENDIX D: Visual selective attention tasks 146

LIST OF TABLES

Table		Page
1	Age Range and Mean for Total Population of Study One	74
2	Attention Checklist Range of Results	78
3	ACL Factor Analysis	79
4	Mean Item Scores Attention Checklist	81
5	Analysis of Variance - Attention Checklist	83
6	Inter-rater Correlation	84
7	Attention Checklist with Factor Loadings	86
8	Attention Checklist Mean Scores	88
9	Attention Checklist - Comparitive Range of Results	90
10	t Values of Performance Tasks	103
11	Analysis of Variance in Receptive Attention Tasks (Posner)	105
12	Analysis of Variance in Visual Selective Attention (Number Finding)	107
13	Auditory Selective Attention - Minute by Minute	109
14	Analysis of Variance in Auditory Selective Attention	111
15	Relationship of ACL to WISC-III Tasks	113
16	Comparitive Means and Standard Deviations of Attention Tests	115

CHAPTER 1

Introduction

The Problem

Context of the problem.

Attention-deficit Hyperactivity Disorder (ADHD) (American Psychiatric Association, 1987) has been described as one of the most common disorders of childhood brought to physicians and psychologists (Breen, 1990). Opinions vary as to its prevalence. When the focus is on the individual symptoms of the disorder, such as restlessness, inattention, or hyperactivity, one often finds population base rates of 50% in school-age children, especially boys. When the focus shifts to the syndrome level, rates range from 3 to 15% in community samples and 50% in clinic referrals (Whalen & Henker, 1991). It occurs in 3% to 5% of the school population and in a 6:1 ratio of boys to girls, (Breen, 1990), or, in a 3:1 ratio of boys to girls (Reeve, 1990). There are current concerns that the prevalence is increasing and that the disorder is more common than expected in subgroups previously assumed to have low rates of occurrence, especially school-aged girls and adolescents of both sexes (Whalen & Henker, 1991).

What is not disputed is that ADHD children are sprinkled throughout every school system and each teacher has occasion to be mystified and concerned and exasperated by the challenge of trying to facilitate such a child's learning.

One of the most active investigators of this disorder, Russell Barkley, conducted studies which added to the knowledge about the hyperactivity component of ADHD. He found that attention deficit children, as a group, were deficient in academic skills and some cognitive areas as compared to control children. When hyperactivity was a characteristic, teachers described the children as noisy, disruptive, irresponsible, and immature. These children demonstrated a deficit in the sustained attention and disinhibition components of attention; what Barkley described as a problem with behavioral organization and disinhibition. When hyperactivity was not part of the disorder, teachers described such children as confused or lost in thought, and apathetic and lethargic. They demonstrated problems with the focused component of attention or that component which involves cognitive processing speed; what Barkley described as a slow

cognitive tempo and mental preoccupation (Barkley et al., 1990).

Low self-esteem, angry outbursts, mood swings and academic underachievement are commonly seen in ADHD children (Whalen & Henker, 1991). Parents and teachers observe the academic and social difficulties, the inconsistent performance of these children, and their frustration mounts. If the child consistently demonstrated low cognitive functioning, academic expectations could be adjusted accordingly. But, for some moments of unpredictable days, the child can function with competency and independence.

Whalen and Henker (1985) looked at the social worlds of ADHD children and reported interpersonal acts that they described as inept, irritating, immoderate, aggressive, or intense. If observed for long enough, the ADHD child, "...will distinguish himself (or, more rarely, herself) by saying or doing things that seem immature, irritating, situationally inappropriate, highly salient, and perhaps also provocative. ... The predictability of the child's so-called unpredictability often makes it quite easy for adults who know him to anticipate problematic behaviors and settings" (p. 448).

Studies show that the presence of a hyperactive child changes the social ecology of a classroom because teachers tend to be more intense and controlling with a hyperactive child. Parents tend to be more directive and intrusive, and, less responsive and positive with their hyperactive children (Whalen and Henker, 1985). It is important to note that Whalen found that adult patterns of responses to these children, both parent and teacher, tended to normalize when hyperactive children were treated with medication. The adults responded to current behaviors.

Whalen speculates that ADHD children's deficiencies in social knowledge may be due to dysfunctions in the way that incoming social information is received and processed, but, she acknowledges that evidence to support that speculation is scarce. She referred to the study by Hechtman, Weiss, and Perlman (1980) which examined the puzzling trend that ADHD children seem knowledgeable about correct social actions and still fail to behave as that knowledge would dictate. They found that when given a multiple choice measure of appropriate social responses, the ADHD children scored as well as the control children. But, when asked to generate a

response to a situation, the ADHD children had great difficulty generating appropriate responses. They had adequate selective skills but not creative skills in social situations. This is an area of frustration for parents and teachers. When talked to, an ADHD child can frequently respond acceptably, picking out the alternative behaviors that the adult would approve of; but, a short time later, on the playground, or with siblings, the misbehavior occurs again.

In situations such as playing a video game, the child's attention can be so riveted that it is almost impossible for an adult voice to break through, but at other times, parents and teachers would describe the child as distractible. In a novel situation such as a visit to a doctor's office, the child's behavior can be age appropriate and the doctor could be inclined to discount the concern.

In summary, ADHD children do exist in our classrooms. The impact of this disorder affects the family, the classroom, and playground atmosphere, but most of all, the child who is helpless to understand why he is always out of synch.

Purpose of the Research. Because of the impact that ADHD has on a child's life, and the increasing awareness that ADHD is going to be a factor in many classrooms, it is important to have a reliable screening instrument and objective measures of performance that will assist with the diagnosis of ADHD and facilitate treatment for affected children. "...Selective attention is essential for meaningful learning." (Lufi et al. 1990, p. 29)

The Attention Checklist (ACL), which was developed by J. P. Das in 1986, is a screening device for teachers to rate the attentional skills of children in school situations. The checklist is comprised of one factor only - attention (Melnyk, 1988), (Das and Melnyk, 1989), and studies to date indicate that it effectively discriminates among children to indicate problems with selective attention (Melnyk, 1988), (Melnyk and Das, 1992), (Das, et al., 1992). This study examined the usefulness of the checklist as a screening device in a regular school setting and compared the responses to objective or performance measures of attention.

Definition of Terms. Attention-deficit Hyperactive Disorder (ADHD) is used as an umbrella term

to subsume all previous labels applied to the disorder. These past labels include Hyperactivity, officially known as the Hyperkinetic Reaction of Childhood, and, Attention Deficit Disorder with its subtypes, with or without hyperactivity. ADHD is understood to be "...a developmentally handicapping condition that is generally chronic in nature, has a strong biological or hereditary predisposition, and has a significant negative impact on academic and social outcomes for many children." (Barkley, 1990, p.36)

Selective attention, as defined by Posner and Boies (1971), is "the ability to select information from one source or of one kind rather than another" (p. 371).

Hypotheses

(1) The factor structure of the ACL in this study sample was expected not to differ from that generated from data in the original study done on mentally handicapped adolescents.

(2) Teacher responses on the ACL were expected to discriminate among children in a regular school setting identifying those who have problems with sustained and selective attention.

(3) Children identified as good attenders based on the ACL ratings were expected to perform significantly better on sustained and selective attention tasks than the children identified as poor attenders by the ratings.

Overview of the chapters

A literature review is presented in Chapter 2 which focuses on the accumulation of knowledge about attention deficit disorder, the suggested means of assessment, and a look at treatment. Chapter 3 presents a review of the literature focusing on the Attention Checklist and the Cognitive Assessment System. Chapter 4 is devoted to the discussion of the first study, which investigated the usefulness of the ACL as a screening instrument for attention problems in a regular school setting. Chapter 5 presents a discussion of the second study, which compared the teacher ratings on the ACL to performance on objective measures of attention. Chapter 6 presents suggestions for further research.

CHAPTER 2

Review of Related Literature and Research

The Developing Understanding of Attention Deficit Disorder

History

In the first half of this century in the United States, children who had learning difficulties were considered to be emotionally disturbed, mentally retarded, or socially and culturally disadvantaged (Silver, 1990).

In the 1930's and 1940's most people who displayed behaviors such as hyperactivity, distractibility, emotional lability or perseveration were categorized as brain damaged or brain disordered whether they had a history of brain trauma or not. Because the children were of normal appearance, it was assumed that this brain damage must be slight or minimal; thus the early label, "minimal brain damage" was coined. During the 1950's and the early 1960's, the descriptor evolved into "minimal brain dysfunction". When no other medical explanation was apparent, it was assumed that neurological dysfunctions too subtle to detect were the cause of the observable behaviors. The term "dysfunction" rather than "damage" was coined to

indicate that the behaviors were not due to tissue damage but to faulty functioning, or "wiring" of the brain (Silver, 1990).

In the 1960's and 1970's, the common label became "hyperactivity", or Hyperkinetic Disorder (Guevremont et al., 1990), because at that time excessive motor activity was considered to be the core of the problem. By the late 1970's it became more commonly apparent that attention, concentration and impulse control were the key difficulties of the condition rather than excessive mobility. The studies of a Canadian, Virginia Douglas, contributed greatly to this advance in understanding of the disorder.

> The McGill research team repeatedly demonstrated that hyperactive children had their greatest difficulties on tasks assessing vigilance or sustained attention, such as the continuous performance test. ... The McGill team also found that hyperactive children could perform at normal or near-normal levels of sustained attention under conditions of immediate and sustained reinforcement, but that their performance deteriorated dramatically when partial reinforcement was introduced, particularly at

schedules below 50% reinforcement. (Barkley, 1990, p.13)

The research of Douglas and her colleagues had a great influence on the development of thought about the disorder and was probably the major reason The Diagnostic and Statistical Manual of Mental Disorders (DSM-III) replaced the term "hyperactivity" with "attention deficit disorder" (ADD) in 1980 (Barkley, 1990). Two basic subtypes, ADD with hyperactivity and ADD without hyperactivity, were specified. In 1987, the DSM-III-R changed the classification to "attention deficit hyperactivity disorder" (ADHD). The descriptors of this term indicate that hyperactivity may be a factor of the disorder, but the essential conditions of the disorder are inattention and impulsivity (Reeve, 1990).

Partially because of it's frequently-changing label -- minimal cerebral dysfunction, hyperkinesis, attention deficit disorder with hyperactivity, attention deficit-hyperactivity disorder, -- the DSM-IV, expected to be published in early 1993, is expected to maintain the label Attention Deficit Hyperactivity Disorder (ADHD) while refining the criteria to reflect recent research.

Definition

Frontal Lobe Dysfunction. In 1986, Chelune and associates conducted a study in which age trends suggested a possible maturational lag in frontal lobe functioning among the ADD subjects. Along the same line, Gorenstein et al., (1989), examined the performance of inattentive-overactive children on several neuropsychological measures for indications of a deficit in the inhibitory mechanisms of the prefrontal cortex. They theorized that such a prefrontal type deficit could impair their ability to sustain cognitive activity in the face of competing responses, or, make them less able to resist distractions.

Schaughency et al., (1989), conducted a study which failed to support the idea that ADD, either with or without hyperactivity, is associated with neuropsychological dysfunction as measured by the Luria-Nebraska Neuropsychological Battery-Children's Revision (LNNB-CR). They cited a 1984 study of 11 children by Lou, Henriksen and Bruhn which showed consistently lowered metabolic activity in frontal cortex and related subcortical structures (right anterior frontal region). They reviewed studies which

implicated a deficient frontal-subcortical arousal/inhibitory system. They maintained that if stimulants work, there must be a dysfunctional monoaminergic system.

When examining frontal lobe function in ADHD children, Loge et al., (1990), found that ADHD children showed impaired functioning in reading comprehension, verbal learning and memory, and on the Information, Arithmetic, Digit Span, Block Design, and Coding subtests of the Wisc-R. But their hypothesis that, "...disturbances in frontal lobe function related to impulse control may be responsible for the cognitive impairments observed in ADHD was not supported. Inability to control and direct attention appears to be more central to the psychophysiology of this disorder" (Loge et al., 1990, p. 540). The authors summarize from this study that although the behavior of ADHD children may be similar to that of adults with frontal lobe lesions, the cognitive performance of those children is not characteristic of severe frontal lobe dysfunction.

> The frontal lobe physiological abnormalities that do occur in ADHD probably arise in frontal components of complex, widely distributed circuits

> involved in the "executive" control of attention. These circuits are anatomically and functionally linked to the parietal lobes(Goldman-Rakic, 1988). Dysfunction within these circuits may produce the diverse cognitive impairments observed in children with this disorder. (Loge et al., 1990, p.544)

Research in the late 1980's and early 1990's is indicating further refinement of our understanding of the problem. Perhaps ADHD is not a problem of attention but a problem of insensitivity to consequences, or, as Barkley states it, a motivation deficit disorder (Barkley, 1990). The task must be of intrinsic interest or have an effective incentive to significantly alter the degree of success with ADHD children (Dalby et al., 1989). Some of the arguments presented by Barkley in support of this theory of the disorder are:

> 1) its greater explanatory value in accounting for the more recent research findings on situational variability in attention in ADHD; (2) its consistency with neuroanatomical studies suggesting decreased activation of brain reward centers and their cortical-limbic regulating circuits (Lou et al. 1984, 1989); (3) its

> consistency with studies of functions of dopamine pathways in regulating locomotor behavior and incentive or operant learning (Beninger, 1989); and (4) its greater prescriptive power in suggesting potential treatments for the ADHD symptoms. (Barkley, 1990, p. 27)

He cautions about the correct connotation of the word "motivation" and stresses that this theory views the disorder as neurological in origin, and no way implies culpability of the person affected.

The theory of frontal lobe dysfunction was a reasonable hypothesis to explore as knowledge of Attention Deficit disorder increased, but now we know that it was a simplistic solution which does not answer the complex deficit.

ADD with hyperactivity and ADD without hyperactivity. Barkley and two associates (1990) conducted a comprehensive evaluation of attention deficit disorder with and without hyperactivity. They cite research on measures of academic achievement and several neurological functions which found no important differences between the two groups. Both groups were found to be deficient in academic skills and some cognitive areas as compared to control children.

Barkley chose to have a fourth group, Learning Disabled children, in his study. His theory was that because many ADD children also have co-existing learning disabilities, differences between ADD and controls on his tasks might be a reflection of their learning disorders. By using non-ADD children with learning disabilities in the same study, Barkley hoped to see which results

> ...Might be specifically a function of the existence of ADD apart from these achievement deficits. ...
>
> The results generally suggest that ...the presence of significant inattention in both subtypes is associated with greater problems with behavioral, academic and social adjustment. However, the additional presence of hyperactivity (ADD+H) is associated with considerably less self-control, greater impulsivity, and markedly worse internalizing and externalizing problems than is likely to be seen by ADD-H children (Barkley et al., 1990, p. 777).

This study found that ADD+H children had more externalizing and internalizing symptoms, more off task time during vigilance testing, more history of familial

substance abuse, and more aggressive relatives than any other group. Barkley found the ADD-H group to have more anxiety disorders among relatives. He summarized the findings as indicating that ADD-H and ADD+H "...may be dissimilar psychiatric disorders with qualitatively different attentional styles..." (p. 788).

When Carter et al., (1990), administered the KABC and Wisc-R to 23 ADHD children and 15 control children, they found that the groups differed significantly on the Sequential Processing Scale of the KABC (the word order subtest especially), and the Freedom from Distractibility factor of the WISC-R.. They cite research which found that evidence is accumulating that ADD-H and ADHD may describe somewhat different clinical populations. Newcorn et al., 1989, found that ADD-H (DSM-III) is a more homogeneous group than the ADHD category of the DSM-III-R. They stated that sequential tasks require effective execution of a series of cognitive events, while simultaneous tasks emphasize an holistic approach and they concluded with a question: Does inattention interfere with sequential processing, or, do these children have fundamental sequential processing deficits per se? They refer to the work of Naglieri and Das who, "... have begun to elucidate

these issues on a theoretical level" (p. 162), but the specific relationship between sequential processing and its attentional requirements is unclear. Do we enhance attention or compensate for sequential processing deficiencies?

Lorys et al., (1990), studied neurocognitive measures to look for differentiation between ADD with and without hyperactivity They cite studies which found that generally, children with ADD with hyperactivity exhibit significantly more aggression and conduct problems, are more impulsive and distractible, and appear to be more socially rejected, whereas children with ADD without hyperactivity "... exhibit a more sluggish cognitive tempo, ... are rated as more shy and anxious, ... and experience a greater incidence of academic difficulties" (p. 120). The research cited suggests that ADD/H children "...have disturbances in the activation or motor-readiness system of attentional control...(and) children with ADD/WO may have a singular deficiency in the arousal (perceptual-responsivity) system..."(p. 121).

A compilation of research findings suggest that ADD/H children are unpopular and guiltless, more sloppy in their work, irresponsible, and characterized by

deficits in attention. The ADD/WO children were frequently found to demonstrate more anxiety and shyness which caused them to be labeled socially withdrawn. They tended to be perceived as poor in athletics, sluggish and drowsy. (Hynd et al., 1989) They point out growing evidence that ADD/H is

> "...related to deficient metabolic functioning of the frontal-cortical inhibitory system. ... This hypothesis is consistent with what is known about the frontal cortex, which has extensive reciprocal connections to the reticular activating system (RAS) and diencephalic region, which are important in arousal, attention and vigilance" (p. 573).

In this well structured study, the neuropsychological tests did not distinguish the two ADD groups, but, the ADD children with hyperactivity did differ from the control group in the variability of the performance during each task, contributing to the evidence that situational variability in performance is a characteristic of ADD/H.

There is still no definitive answer to the debate about the hyperactivity component of Attention Deficit Disorder. The behaviors and the problems of the children diagnosed as ADD/WO are very different from

the ADD/W children. ADD/WO may be a distinct disorder. The focus of the literature reviewed for this study examined Attention Deficit where hyperactivity could be a component.

Overview

In 1979, Gordon examined the hyperactive child's ability to inhibit behavioral responding by using a technique from operant conditioning research called Differential Reinforcement of Low Rate Responding (DRL). Previous researchers had found that participants in a time-based situation often engaged in a sequence or chain of behaviors between reinforceable responses. The McGill researcher, Douglas, found that, "the frequency of extra movements made by hyperactive children during a delayed reaction time task was positively related to the efficiency of their performance" (p. 319).

To further explore this theory, Gordon observed children under clinical DRL conditions. He observed a variety of inter-response behaviors. He reported that 90% of the hyperactive participants used observable mediating behaviors. The subjects whose mediating behaviors were not observable reported using cognitive strategies such as counting between responses. The

children who used an observable (physical) collateral scheme did worse on the DRL schedule than children who did not use an observable scheme, leading Gordon to speculate that the hyperactivity in ADD might be a series of mediating behaviors developed in an effort to control impulses.

An optimal stimulation theory presented by Leuba in 1955 led to speculation that motor responses added into rote tasks would modulate the sensation-seeking activity and impulsive errors of ADD-H children. "...It may be possible to channel the disruptive and impulsive activity of hyperactive children into socially appropriate and task-related responses." (Zentall & Meyer, 1987, p. 535)

Focused attention is the ability to ignore irrelevant information and concentrate on relevant information (van der Meere et al., 1988). Failure to inhibit processing of irrelevant information indicates a focused attention deficit. Frustration in school occurs because of this distractibility (Lufi et al., 1990). Perceptual and attentional skills are an important aspect of measured intelligence (Aks & Coren, 1990) making the typical school experience discouraging and frustrating for ADHD children.

Excessive motor activity is no longer considered to be the only, or even the distinguishing behavioral characteristic of the disorder. Research repeatedly suggests that deficits in sustaining attention, and in inhibiting impulsive responses, as well as inconsistent performance are also observable behaviors of the deficit. This inattention, impulsivity, and inconsistency interferes with every aspect of the child's life. The child does not interact well with family members, encounters failures, both academic and social at school, and lives with frustration and disappointment. Cognitively, ADHD children tend to display weaker problem solving skills than peers and comparatively less self-monitoring (Fehlings et al., 1991).

Marturano (1986) examined the relationship between behavior and academic achievement and found that less successful children are less able to ignore potentially distracting events. Marturano's study adds to the accumulating general view that academic achievement is behavior related among low achieving children. Less successful children are less attentive to task. Less successful children engage in more behaviors which tend to delay seatwork and ultimately negate its value.

Children who exhibit more short-term distraction responses, and have less long-term academic gains, are more affected by peer produced stimuli and by unusual intruding events. Once detached from a task they have more difficulty returning to it.

Douglas & Benezra (1990) discovered that deficits became most apparent in ADHD boys on measures requiring organized deliberate rehearsal strategies, sustained strategic effort, and careful consideration of response alternatives. This pattern suggests impaired self-regulatory or "executive " processes.

In 1989, Naglieri published an overview of recent research using the PASS (Planning, Attention, Simultaneous, and Successive) cognitive processing tasks with Reading Disabled, Developmentally Handicapped, ADD, and Delinquent populations. His summarized findings indicate that the attention deficit group were deficient on the attention tasks and also when required to use planning and successive processes. This group was similar to the control group only on the simultaneous tasks.

When a dual task was presented to children, Schachar & Logan (1990) found that ADHD children's performance on the primary task deteriorated more than

that of control subjects with the introduction of a secondary task. They felt that this indicated that ADHD children paid a greater concurrence cost or have a different allocation policy. ADHD children also exhibited longer reaction times to the secondary task, indicating greater refractory effects or difficulty shifting from primary to secondary task processes.

Hynd et al., (1990) examined the specificity of deviations in patterns of normal brain asymmetry using magnetic resonance imaging scans. In this study, both dyslexic and ADD/H children had significantly smaller right anterior-width measurements than did control children. Control children clearly demonstrated Left greater than Right asymmetry of the anterior region. These authors conclude that some deviation in normal patterns of brain development is responsible for ADHD.

"Attention Deficit-Hyperactivity disorder (AD-HD) (American Psychiatric Association, 1987) is a developmental disorder of age-appropriate attention span, impulse control, and rule-governed behavior (response to rules and instructions) that sometimes includes overactivity and restlessness (Guevremont et al., 1990, p. 51). This inclusion of the term, "developmentally", acknowledges that younger children

normally display higher rates of these behaviors than older children. The disorder must be pervasive but it is becoming accepted that there is a situational variation in ADHD symptoms. The American Psychiatric Association also specifies that the signs "...may be minimal or absent when the person is receiving frequent reinforcement or very strict control, or is in a novel setting or a one-to-one situation (e.g., being examined in the clinician's office, or interacting with a videogame") (p.50).

When hyperactive children are compared to their agemates, the studies indicate that they, "...tend to engage in higher frequencies of undesirable social behaviors. Other people find them irritating and objectionable. In the classroom they are often off-task, noncompliant, and disruptive. At home and in playgroups they tend to be disagreeable and to have more than their share of negative social interchanges (Whalen, 1985, p. 452). Whalen describes ADHD children as those who experience difficulties in situations in which they could be expected, on the basis of their age, to be reasonably competent.

According to Lam and Beale (1989), difficulty with response control is the primary symptom of ADHD. ADHD

girls more frequently show cognitive deficits while ADHD boys show conduct problems, thus the girls are frequently not diagnosed as ADHD.

Dr. Joel Fagan, in a workshop on Attention Deficit Disorder (1991), described the essential symptoms to be:

a. Disordered attention: the three components being (i) weak attention (short attention span); (ii) eccentric attention (a child concentrates on the periphery of a problem, not on the core. An analogy would be to think of someone looking at the knobs of a TV rather than the screen.); (iii) divided attention (the child partitions his/her attention inefficiently and becomes overwhelmed).

b. Distractibility: - there is counter productive competition of irrelevant stimuli with relevant stimuli. The stimuli can either be external (sensory and/or social) or internal (daydreaming, emotional preoccupation or mind tripping: thoughts, ideas and emotions form a chain of linked thinking. The child becomes inaccessible.) The child's brain makes a choice of which stimuli to follow. This choice is automatic and he is unaware of it. Frequently, it

is observed to be the wrong choice and this is the most handicapping manifestation of distractibility.

c. Impaired task completion - the child is underproductive.

Dr. Fagan described several optional symptoms that add to the stress and pain of life for an ADHD child:

a. Hyperactivity - either gross motor, fine motor or verbal; an excess of purposeless activity.

b. Impulsiveness - one cannot edit behavior based on predictable consequences. An unhappy past experience does not curb repetition of the behavior.

c. Insatiability - a craving for affection, attention and/or material goods.

d. Discipline problems - the child seems not to learn from past experiences.

e. social problems - they lack social awareness, a sort of social radar. We pick up signals of how we are perceived; we fine tune how we present ourselves. ADHD children frequently do not.

f. Sleep problems

g. Emotional lability - the child could be changeable and unpredictable. We never know what will make him/her happy or unhappy.

h. Inconsistency - this is perhaps the most frustrating symptom that can be present in ADHD children. At times, everything seems to be in place; the child has a good day, or at least a good period of time. Selective attention with these children is like a beacon that flashes on and off unpredictably. It is not that they don't want to learn; it is that the ability to select what stimuli to attend to is beyond their control.

i. Additional learning, conduct or psychiatric disorders - frequently if there is one problem, there are several interacting problems.

Whalen and Henker (1991) enunciated "two truisms" about the interpersonal difficulties of children with ADHD. The first is that the vast majority of these children have serious social problems pervading every aspect of their lives so that they are involved in conflicts and confrontations. The second is that their social behaviors are inconsistent or unpredictable. "Compared to their peers, ADHD children seem less likely - or less able - to modulate their behaviors in accord with environmental cues, often appearing unresponsive to changing situational and role demands" (Whalen & Henker, 1991, p.231). They speculate that

there may be social learning disabilities, somewhat comparable to academic learning disabilities,

> ...that prevent children with ADHD from mastering the subtle yet perpetual decoding, enactment, self-monitoring, and fine-tuning required for effective interpersonal exchange. Perhaps these children have more difficulty than peers inhibiting prepotent but inappropriate responses or marshalling and sustaining the energy required to maintain harmonious contact. Another possibility is that they follow different social agendas, more likely to seek sensation and stimulation than consensus or approval (Whalen & Henker, 1991a, p.231).

In another article on therapy for the disorder these authors go so far as to describe ADHD as a lifestyle rather than an acute disorder (Whalen & Henker, 1991b, p.135).

Recent studies have found that there may be a genetic component to ADHD as the disorder is more frequent among first-degree biological relatives of patients with ADHD (Balon, 1990). Accumulating research suggests that it is, "...a chemical brain disorder that is genetically based, and that while it

is not a problem that can be cured, it can be treated and controlled." (Meents, 1989, p. 169)

In support of the biological basis of ADHD, are the findings of Baker et al., (1991) in which the total PEA (B-phenylethlyamine) was significantly lower in the ADHD patients, and plasma levels of Phe (phenylalanine) and Tyr (p-tyrosine) were also decreased in the ADHD subjects compared with the normal controls (p.15).

The reticular activating system is thought to be responsible for arousal. An analogy would be that it turns on the house lights of awareness or attention. The frontal lobes which are responsible for focusing arousal could be compared to turning on a spotlight or focusing the attention to specific stimuli. Brain activity can be compared to an electrical phenomenon requiring integrated circuits. Neurotransmitters, specifically dopamine, are required to open and close the circuit every one/one-hundredth of a second. It is now believed that ADHD children lack the ability to produce 100% of the dopamine needed by the brain (Fagan, 1991).

The best current summary of our understanding of this disorder comes from Russell Barkley and his associates who have described ADHD as "... a

biologically based temperamental style that predisposes youngsters to be inattentive, impulsive and physically restless, as well as deficient in their capacity for rule governed behavior. " (Anastopoulos et al., 1991, p. 214)

The Developing Means of Identifying Attention Deficit Disorder

Assessment

Tasks. Inattention and distractibility are cognitive processing problems. Lufi et al. (1990), advocated the use of the color-word test originated by Stroop because it takes longer to name color hues than it does to read their names. Color naming is a more complicated task than reading, because it requires a variety of behavioral responses. They called the Stroop interference test "...a measure of ability to overcome distractive stimuli" (p.33). In their study, ADHD children displayed difficulties in processing incoming information and in resisting the interference of other distractions.

Conte et al., (1986), postulated that hyperactive children, when compared to control children, have difficulty with paired associate learning of arbitrary associates, complex search tasks, and problem solving,

but, no difficulty with simple reaction time and meaningful paired associates. They questioned whether some tasks are simply more sensitive to ADHD or whether the level of task-related stimulation and task difficulty causes the deficit.

Klee (1986) cited research which described ADHD children as more impulsive and more inaccurate than controls so he recommended tests designed to measure reflectivity, impulsivity, attention to detail, and frustration tolerance. He recommended the Trail Making Test where children are asked to sequentially connect mummers alone, then numbers to letters sequentially. He also recommended the Stroop Color Word Test which deals with increasing complexity. He described these tests as among the most frequently used tests to provide information regarding sequential reasoning, motor planning and execution, and frustration tolerance .

Cohen et al.(1990) concluded that the WISC-R third factor was not a reliable measure of ADHD. They stated that multiple methods of assessment must be used which include measures of attention and vigilance, reaction time, perceptual search, and problem solving ability.

Blondis et al., 1989 stressed that the difficulty in interpretation of psychoeducational test scores is significant. The overlap between patterns of attention deficit and memory-based learning disabilities is great. They emphasized that the pediatrician must be knowledgeable about the interpretation and potential abuse of tests which they choose to use.

Rating Scales. Atkins and Pelham (1991), proposed that school based assessment focus on the treatment that would be most efficacious for the student at school and clearly avoid the unresolved diagnostic issues of the times. Teacher reports were emphasized as a useful part of assessment because teachers observe children on numerous occasions compared to same age/sex peers and teachers have , study after study proven to be objective - not emotionally involved.

Brown, in a 1986 study, showed that teacher ratings had the potential to discriminate ADD from ADD-H groups and recommended teacher ratings as a valuable source of information in the assessment of children.

Many measures of attention currently are available and used in studies with children. The Das attention checklist was used in this study to rank order the

children according to attentiveness in school situations. Das describes ADHD as a disruptive behavior disorder and disruption usually occurs at home or at school, not in the one-on-one clinic setting, so a rating scale for home and school is needed to identify children with attentional problems. Teachers are possibly more reliable raters than parents, according to Das, because teachers are more familiar with age-appropriate norms of behavior for children (Das & Melnyk, 1989).

Biederman et al. (1990) found a high probability that if a diagnosis is made in the parent report, it will be corroborated by the teacher report. Regardless of the reliability of the rater, the information is significant and can be a valuable component in the overall picture developed by a clinician (Blondis et al., 1989).

Zelko (1991) encouraged the use of multidimensional rating scales in clinical differential diagnosis and unidimensional scales such as the Connors ARS to assess change or treatment effects.

Continuous Performance Index. Grant et al., (1990), looked at continuous performance tasks and neuropsychological tests in children with ADHD. The

Continuous Performance Task (CPT) was first introduced in 1956 by Rosvold, Mirsky, Sarason, Bransome and Beck "...to measure sustained attention and alertness of brain-damaged patients" (p. 435). Grant and his associates used the Gordon Diagnostic System (GDS) in their study to measure sustained attention and impulse control. The Delay Task is assumed to measure impulse control and the Vigilance Task and the Distractibility Task are both assumed to be a measure of sustained attention and impulse control. "It could be suggested that continuous performance tasks assumed to measure attention and distractibility may also assess some measure of general intelligence or higher cognitive reasoning ability" (p. 442).

In 1986, Gordon described his diagnostic system as a standard procedure for evaluating certain aspects of attention and self control, and he stressed that it is to be used only in compliance with other selection criteria when diagnosing Attention Deficit Disorder.

Mettelman and Bilinski (1988) described the GDS as a behavior-based measure of attention and self control, consisting of a series of continuous performance tests as well as measures of response inhibition. They examined the GDS because of the source-dependence of

information with regard to ADHD. The overwhelming findings have been that the data from parents, teachers and laboratory measures have not been consistently similar. The advantage of the GDS is that the child can be observed in situations that require attention and self control. "The evaluation of a subject's ability to attend may allow for determining deficits in competence vs. performance" (p. 689). The intent is to provide behavior based information in a multimodal assessment.

Seidel and Joschko (1990) conducted a study investigating CPT using the Seidel Continuous Attention Test (SCAT). Their results in normal children indicated that children's performance did deteriorate over time on a prolonged task. Results did not vary by gender, but did vary by age. They concluded that the ability to sustain attention increases with age and does not vary by gender. They recommend that comparisons between groups of ADHD and controls be conducted in within-age-level groups rather than across age groups in order to be more clinically sensitive.

Halperin et al. (1990). conducted a study involving teacher-rated control and ADHD children. The subjects were given a CPT and then were further

subdivided based on this objective measure of inattention. Their findings indicated that ADHD children with objectively assessed attentional dysfunction appeared to be cognitively impaired. ADHD children without objective evidence of attentional dysfunction had more conduct problems. They cited a previous study by Halperin et al. in which "only nonaggressive ADHD children were found to be inattentive" (p. 447).

The pitfalls of the continuous performance test were examined by Irwin et al., (1989), who concluded that no diagnostic decisions regarding the presence or absence of attention deficits should ever be made on CPT scores alone. They stressed that data derived from the child's actual behavior as well as the parent and teacher data are important sources of information when attempting to make a diagnosis. Poor performance on a Continuous Performance Task such as the GDS is not necessarily solely indicative of attentional deficits. Other cognitive deficits could be impacting the performance as well.

Multiple Measures. Lahey et al., (1987), compared the accuracy of rating scales of hyperactive children to a comprehensive assessment which included the scales

and strongly recommended that rating scales alone not be used to make a diagnosis.

Blondis et al., (1989) stressed that questionnaires cannot rule out or diagnose an attentional problem. They should be used as an additional source of information. "Only through an ecological approach that combines developmental history and behavioral questionnaires with a thorough physical examination, comprehensive psychoeducational testing, and interdisciplinary problem solving can the clinician accurately define the child's behavioral dysfunction" (Blondis et al., 1989, p.268). They advocated an ecological approach which combines " developmental history and behavioral questionnaires with a thorough physical examination, comprehensive psychoeducational testing, and inter-disciplinary problem solving..." (p. 274) approach in order to accurately define the child's behavioral dysfunction.

Klee (1986) stressed that any assessment should be cross situational, multi-dimensional and multi-disciplinary.

The implication of this broad based identification of ADHD is that schools will have important information for the practitioner who is charged with diagnosing and

treating the disorder. The development of self-directed, rule-governed behavior becomes crucial to a child's successful experience at school. Teachers can be important sources of information and thus, there is a need for teacher screening devices to help identify children with attentional difficulties.

The Impact of Attention Deficit Disorder Reading

August and Garfinkle (1990) examined 115 boys diagnosed as ADHD and found that 39% of them also had a specific reading disability. They then compared these ADHD plus reading disabled boys to "pure" ADHD and controls on a battery of attentional and cognitive measures. Both the "pure" ADHD and the reading disabled ADHD boys "performed significantly worse than controls on measures of sequential memory and attentional tasks involving impulse control and plannful organization" (p. 29).

Kupietz reported in 1990 that performance on a CPT improves as children age whether these are reading disabled children, ADHD plus reading disabled children, or control children. The Reading Disabled children improved significantly with age making more correct

detections as they got older. The Reading disabled plus ADHD group did show these age improvements, but not to the same extent. Older RD children appear to some extent able to compensate for early deficits that may be related to attention and/or language processing difficulties. The ADHD children seemed less likely to effect a similar compensation with increased age.

Because the performance of ADHD and control boys did not differ on three measures of serial recall, Benezra & Douglas (1988) concluded that it appears that the cognitive deficits of ADHD children cannot be attributed to deficient retention of verbal stimuli. Their tasks were age sensitive, but their results suggest "comparable encoding speeds and similar patterns of spontaneous decay of verbal traces in ADHD and normal children." (p.522).

Attention Deficit Disorder impacts a child's ability to be an efficient, effective reader. This has a profound effect on school success and personal fulfillment.

Social

In any list of core symptoms of ADHD, social difficulties are often overlooked. For example, they are not included as a diagnostic criterion in DSM III.

Whalen describes the social troubles of ADHD children as central and pervasive and cites Barkley's study in which 81% of parents of ADHD children rated their offspring as having serious problems playing with other children. In comparison, 7% of the control children were rated similarly. She cites studies that conclude that social deficits tend to be durable, recurrent and often escalating, even to the extent that negative peer relationships tend to predict serious adolescent and adult problems. (Whalen & Henker, 1985)

Whalen et al., (1989) examined the effect of stimulant medication on the peer status of hyperactive children. They cited research to establish that stimulants improve the social behaviors of hyperactive children, but conducted this study to examine potential changes in peer status. They found that Methylphenidate (Ritalin) enhanced social standing. The nominations of hyperactive boys as best friends, as cooperative and fun to be with, increased with the higher dose of medication, but the peer appraisals did not come close to the standards for the controls. In other words, the medication improved, but did not normalize, the social standing of these children.

Whalen et al., (1990) looked at social judgement processes in hyperactive boys by getting them to evaluate the behaviors of unknown peers. The ADHD boys were sensitive to medication-related differences in the behavior of peers. Regardless of their own medication status, they were able to identify more undesirable behaviors in peers who were on placebo than those who were receiving methylphenidate. It is interesting to note that judges with the most serious behavior problems tended to identify the most negative behavior in peers, especially when both judge and target were unmedicated.

Childhood difficulties negotiating everyday social worlds place ADHD children at long-term risk, with at least 50% continuing to have interpersonal problems during adolescence and adulthood. On medication, children become less negative and more responsive with parents; less disruptive and impulsive in class and playground; more appropriate when interacting with peers (Whalen et al., 1989). The authors found that, in contrast to peers, adult caretakers react on the basis of children's ongoing behavior rather than according to prior experiences and expectancies.

The self esteem of the ADHD child is under continual assault. The disorder interferes with academic learning at school, leaving the child aware that he has somehow not met with the teacher's expectations. He tries to play with peers, but frequently is in conflict with them without understanding why they are upset. If this negative spiral can't be broken, the problems compound as the child ages.

Treatment

Introduction

For the past three decades, debate has surrounded the diagnosis and treatment of ADHD: does such a syndrome really exist; if so, is its basis physical or psychogenic; and, should it be treated with medication, diet changes, behavior modification, cognitive therapy, family systems therapy or some other therapy? The management of this deficit is not universally agreed upon. A variety of interventions rather that one single "cure" is more commonly advocated now, including:

a. Demystification: informing parents and teachers that it is a biological problem, not a

character deficiency. It is important to explain, as simply as possible, the nature and frequent manifestations of the disorder.

b. Academic interventions: providing teachers with strategies for motivation and possible alterations of classroom climate to benefit the child.

c. Parental advice: giving parents information to help them support and motivate their child; strategies to assist necessary behavioral changes.

d. behavioral intervention with the child: training the child to self monitor; reinforcing desired behaviors. But, no counselling strategy will increase selective attention. It will only reinforce some behaviors. (Fagan, 1991)

These strategies are helpful up to a point and are part of a whole treatment, but have little long lasting impact by themselves. Medication, according to Dr. Fagan, is the only treatment that can strengthen attention.

Medication

The psychostimulants, Ritalin (methylphenidate), Dexedrine (Dd-amphetamine), and Cylert (pemoline), enhance the action of certain neurotransmitters and are thus thought to stimulate both the reticular activating

system and the limbic system as well as other regions of the brain that are thought to be responsible for attention, arousal and the inhibitory processes. (Anastopoulos et al., 1991) These Authors also cite research which indicates that these stimulants may lower the central nervous system threshold for reinforcement. This would explain the behavioral effects of stimulants where children are able to stay on task longer and with greater accuracy.

It has been theorized that stimulant medications enable ADHD children to have longer and more effective periods on task because these medications produce a generalized cognitive constriction, or, "over-focusing" (Solanto and Wender 1989).

Solanto & Wender (1989) conducted a study employing tests of divergent thinking in order to test this theory. Their hypothesis that children on stimulant medication would not demonstrate a flexible problem-solving approach was not supported.

Instead the results of their study suggest other possible theories. The decrease in performance over placebo days suggests that stimulants enable ADHD children to maintain an optimal state of physiological arousal. On one task, the Alternate Uses Test, the

performance of ADHD children did decline in subsequent sessions. These authors suggest that this supports the theory that boredom sets in after repeated exposures to similar tasks even when they are spaced over weekly intervals. This coincides with Barkley's theory of motivation. ADHD children seem to attend well to novel stimuli or when receiving frequent reinforcement but they tire of, or get bored with, tasks more quickly than other children do.

Milich et al. (1989) conducted a study of ADHD boys' self evaluations on medication versus placebo. One finding was that while receiving medication, there was an increased correspondence between performance and self-evaluations. They theorize that the medication may have led to better attending behavior so that the boys were more aware of how well they were doing; or, the medication may have led to more reflective responding from the boys.

Jacobvitz et al. (1989) conducted a review of the literature to that date and found "overwhelming" evidence for the short-term impact of stimulants on attention and behavior. Stimulants improve the ability to sustain attention and reduce "task irrelevant" activity or unnecessary physical movements in

structured classroom situations. They found the literature to be inconsistent about activity level on the playground.

Difficulty with auditory memory tasks and difficulty following sequential instructions seem to be especially prevalent in ADHD children (Keith & Engineer 1991). These behaviors are examples of an auditory processing disorder. The inability to attend for sustained periods of time has obvious significance in children's social and cognitive development. These authors found that when ADHD children were on a treatment of methylpheñidate, there was a significant improvement in their performance on an auditory continuous performance test and a screening test for auditory processing disorders. They hypothesized that the attentional problems of the children caused them to lose auditory information presented at fast rates. They suggest that classroom management recommendations aimed at enhancing listening opportunities be developed.

Desipramine is a tricyclic antidepressant which has been used with some children with ADHD and has demonstrated efficacy (Gualtieri 1991). Some neuropsychological effects such as a small but

significant decline in motor performance and an improvement in long-term verbal memory have also been noted in ADHD children while treated with this drug. The decline in motor performance is common to other tricyclic antidepressants, and the improvement in memory performance is an effect it shares with the psychostimulants. These factors should play a role in the selection of a treatment for ADHD.

Whalen et al. stress that, given the risks of both physiological and psychological toxicity, it is always advisable to use the lowest dosage that proves effective. Group data may consistently indicate linear dose-response improvements, but surprisingly few individual children follow the group pattern. (Whalen et al., 1989).

Although stimulants are the traditional drugs of choice in the treatment of ADHD, as many as 30% of children treated do not improve (Brown et al. 1990). Alternate therapies include tricyclic antidepressants (TCAs), monoamine oxidase inhibitors (MAOIs), and antipsychotics.

Based on their own study and existing data, Brown et al. propose that the TCA imipramine may be equal in efficacy to methylphenidate in the treatment of ADHD.

In their study, one half of the children received imipramine and the other half received combined carbamazepine and imipramine for 1-6 months. "The combined treatment group had significantly lower mean levels of imipramine, desipramine, and total tricyclic antidepressant compared to those children receiving imipramine alone (p.359). They conclude that increased imipramine doses may be necessary for adequate response in children on combined therapy and caution that toxicity could result upon withdrawal without imipramine dosage adjustment.

Limitations of Medication

Stimulants, the mainstay of treatment, have side effects such as delay in onset of sleep, decreased appetite, inhibition of growth and sometimes mood changes. A doctor at Wayne State School of Medicine advocates studying Buspirone as a treatment for ADHD. "Buspirone is a potent presynaptic dopamine antagonist, it increases the firing rate of midbrain dopaminergic neurons in the rat and increases dopamine concentration at synapses" (Balon 1990). Because Buspirone is a drug with a low frequency of side effects and low addictive potential, he advocates its study with ADHD children.

Much media controversy has arisen periodically about the side effects of stimulant medication. According to Anastopoulos et al., (1991),

> ...side effects are typically quite mild relative to other classes of medications. The most frequent side effects are decreased appetite and insomnia, with a minority of cases reporting somatic symptoms (e.g.headaches or stomaches), increased tension, growth inhibition, and increases in heart rate or blood pressure. (p. 212).

These authors go on to state that most often these side effects can be controlled or dissipated by a change in dosage. They stress the importance of close monitoring by a physician.

Whalen et al. (1991) examined ADHD boys' expectancies and self-evaluations when medication was involved as part of treatment. They examined children's self-perceptions because of "...demonstrations that maladaptive self-evaluations and attributions hamper performance, ... and positive control and efficacy beliefs are associated with improvement during psychotherapy" (p.602). They describe ADHD as the most prevalent childhood disorder

for which the primary treatment is pharmacological rather than behavioral or psycho-social and this treatment often continues for years, during childhood and adolescence and sometimes even into adulthood.

They examined the emanative effects of the treatment: the cognitive and psycho-social impact of medication. "The open-ended comments of ADHD children often suggest that they attribute outcomes to pills rather than to skills." (p.602). "These findings indicate that stimulant treatment has unintended yet detectable effects on self-cognitions. When told they had taken a placebo instead of their regular pill, ADHD boys who were accustomed to taking medication evaluated their performance and effort less favorably. It was the boys who were not medicated who proved more susceptible to the medication information; self-perceptions of medicated boys' were relatively immune to the expectancy induction" (p. 605).

Whalen and Henker (1991) looked at the impact of stimulant treatment for ADHD children and concluded that the "effects of stimulant medication appear limited in scope as well as in time" (p. 238).

Swanson et al. (1991) also reviewed the effects of stimulant medication and found that frequently it

improves classroom management and student time on task for the short term; but they shared Whalen's concern that stimulant medication doesn't improve learning and long term achievement.

Stimulant medication has been frequently cited as the single most effective treatment approach for ADHD. But long term studies have generally found no long term gains in academic achievement for children receiving stimulant treatment alone.

Stimulant treatment does not seem to improve cognitive skills such as problem solving (Fehlings et al. 1991) and parents are increasingly reluctant to consider medication to treat a behavioral disorder.

Cognitive Training

Cognitive Training is described by Abikoff (1991) as inherently appealing but he can find little empirical support for its clinical utility. The ultimate goal of cognitive training is to enable ADHD children to develop self-control and the reflective problem solving strategies that they seem to lack. In order to alter the impulsive responding style of ADHD children, cognitive training practitioners teach them to use self-instructional statements.

Abikoff can find little research to determine if this self-talk is indeed changed. Instead, his research indicates that controlled studies show little change in academic functioning when medication is not part of the treatment. He cites one successful exception to this general trend - a study which combined therapies to include cognitive self-control training, specific strategy training to enhance associative and sorting skills, and attributional training that focused on coping with failure and success experiences. "... none of the studies has generated results to indicate, or even suggest, that cognitive training is a competitor to stimulants, or that it enhances their beneficial effects " (p. 208).

et al. (1988). designed a study to examine cognitive training with academically deficient ADHD boys receiving stimulant medication. Compared to the control group receiving remedial tutoring plus medication and a group receiving medication alone, the results showed no significant academic gains for the children receiving academically based cognitive training. A further follow-up indicated that the cognitive training group did not make any gains in the realm of self-esteem.

One recent investigation of cognitive behavior therapy (CBT) in Canada found significant improvement of behavior according to parent and teacher ratings, and child self-ratings. CBT attempts to increase self-control and problem-solving skills in ADHD children by modeling the desired behaviors, through role playing troublesome situations, and by teaching self-talk or self-instruction in a variety of situations (Fehlings et al., 1991). One perceived value of CBT is that it provides parents with a positive, systematic approach to respond to their child's behavior. Perhaps more parental involvement is the key.

Therapies

Pisterman et al., (1989) reviewed the research of intervention with preschool-aged ADHD children and found that neither pharmacological nor cognitive self-control interventions have produced the positive results that have been reported with school-aged children. Individual parent training using a compliance training model has been reported to have some success. Their study provides support for the benefits of parent-mediated behavioral intervention with preschoolers.

Effective early intervention with children with conduct symptoms and attention deficit symptoms should be a very high priority for society, given that,

> (1) these symptoms tend to persist over time (Kazdion, 1987); (2) they carry an even poorer prognosis when present in tandem than when either set of symptoms is present by itself (Milich and Loney, 1979; Thorley, 1984); and (3) some evidence suggests that externalizing symptoms are more accessible to learning-based interventions when a child is younger (Anderson and Nuttall, 1987; Strain et al. 1982). ... Several parent variables have been found to predict low responsiveness to parent training interventions: depression (McMahon et al. 1981; Worland et al. 1982), low social support (Dumas and Wahler, 1983), and low father involvement or single parent status (Patterson, 1976; Webster-Stratton, 1985).
>
> These findings pose a dilemma: the same characteristics posing a problem to parent training interventions predict high risk for psychopathology in children. If only those parents most likely to respond to intervention are chosen, those families at highest risk for

> pathology may be eliminated; if only those families at highest risk are chosen, those who can be helped the most may be eliminated (Strayhorn and Weidman, 1989, p. 888).

Parent practices can be improved by training and that improvement can cause positive changes in child behavior. (Strayhorn and Weidman, 1989).

The parent training advocated by Anastopoulos et al. involves learning to use "differential attention to appropriate and inappropriate behavior" (p. 214), and to use a time-out procedure. Any such therapy does not claim to cure or eliminate the disorder. The goal of therapy has to be to learn "methods of coping with and compensating for this ongoing learning and behavioral disability" (p.214).

Multiple Treatment Methods

Since ADHD children have multiple difficulties (academic and behavioral), multimodal interventions would seem to be called for.

Described as the two most commonly and effectively used therapies for ADHD are stimulant medication treatment and parent training in behavior management techniques (Anastopoulos et al. 1991). They conclude that ADHD requires multiple treatment methods over long

time periods if there is to be any possibility of impact on the outcome of these children. They describe stimulant medications as lowering the threshold of sensitivity to reinforcement, thus allowing the ADHD child to plan or regulate actions. "Current theories of ADHD ... suggest it may be a biologically based deficiency in sensitivity to reinforcement or other motivational factors ... (p.210). That is, ADHD is more properly described as a deficiency of the child's sensitivity to the environmental reinforcers which usually motivate children.

All the research indicates a need for a varied treatment. The medication creates a state where changes can be attempted. Parent and teacher education and use of behavior management techniques help change patterns of behavior or habits. Treatments must be maintained over longer time intervals than previously if we hope for a greater impact on the long-term outcome of ADHD children. (Anastopoulos et al., 1991)

Because the "profusion of problems" called ADHD demands multiple treatment methods, three major treatment modalities for ADHD were examined by Whalen and Henker (1991b): (1) stimulant treatments - primarily methylphenidate; (2) behavioral treatments

including contingency management and parent training; and (3) cognitive-behavioral or self-regulation therapies.

They found that the predominant therapy continues to be stimulant treatment (ST), primarily methylphenidate. Behavioral treatment, especially classroom contingency management and parent training, is the other major therapy currently in use. The self-regulatory focus of Cognitive-Behavioral Treatments (CBT) is also popular because of its correspondence to the self-control deficits of ADHD children.

These non-pharmacological treatments stress problem-solving and coping skills to both ADHD children and significant people in their lives. While acknowledging the beneficial impact of stimulant medications over the past two decades, Whalen and Henker noted the serious limitations of such treatment. Not all children can be administered these medications and not all who receive them improve. Benefits seem to last only for the duration of the treatment. When medication is discontinued, the targeted behaviors reappear. More long term research is needed for multi-modal treatments.

Summary

American researchers, Campbell and Cohen (1989) discovered that a diagnosis of ADHD does not qualify a student for special education services in most of the United States. "The American Academy of Pediatrics (AAP) has recommended that the initial treatment of attention deficit hyperactivity disorder (ADHD) should be educational and behavioral." (p 191).

Although the medical profession advocated educational intervention, the current government designation of Special Needs in education does not qualify an ADHD child for any form of intervention.

> "The designated handicapping conditions are as follows: hearing impaired; visually impaired; mentally handicapped; orthopedically handicapped; speech and language impaired, behavior disordered, learning disabled, and other health impaired. In order to qualify for special education services, it must be demonstrated that the student has one of these handicapping conditions and that this handicapping condition results in academic underachievement. ... even ADHD in the presence of academic underachievement or failure does not qualify as a handicapping condition in a majority

of special education districts (Campbell & Cohen, 1990, p. 191).

This is true also in Alberta. Unless a child is designated as severely behaviorally disordered by a specialist such as a psychiatrist, there is no special funding to help school systems meet the needs of these children. Early diagnosis and intervention is essential if we are to preserve the child's self esteem. Since the structured setting of the school is the common place for ADHD to become apparent, teachers can play an important role in early intervention. A screening device to identify children with poor attentional skills could be the first step to help for an afflicted child. After referral to a clinician, the knowledge of the precise cognitive weaknesses as clarified by an intelligence test such as the CAS could help teachers to plan academic strategies for these children.

CHAPTER 3

Review of the Literature: Attention Checklist and Cognitive Assessment System

Attention Checklist

Classroom teachers are being asked to meet the educational needs of an ever-widening range of children. Physical disabilities and cognitive delays present specific challenges which teachers can meet with creativity and special planning. Learning disabilities, once they become apparent, can be mediated with modified curriculum and specially designed materials. But every classroom could potentially have an ADHD child - that child who confounds and exasperates parents and teachers.

The earlier identification and intervention occurs, the more chance there is for a successful outcome for the ADHD child. ADHD symptoms are usually not apparent in a doctor's office. The troublesome behaviors are usually observed at home and at school. "Therefore parents and teachers provide invaluable diagnostic information regarding the frequency and severity of the child's behavior in these settings" (Melnyk, 1988, p. 27). To use an attention rating scale as a screening device in a regular classroom can

provide a measurement of variations of attention in that group.

> ...Teachers' rating scales typically have been used for detection of attention disorders in hyperactive children. ... It is of interest to determine how useful such rating scales are for detecting poor attention as a measure of normal variations in attention without any explicit reference to impulsivity or conduct disorder. (Das et al., 1992, p. 37)

The Attention Checklist (ACL) was developed by Das (1986) in response to the need for a measure of children's attentiveness without reference to conduct disorder or hyperactivity. Its first structured study was with a group of 100 mentally handicapped adolescent students who were not categorized as hyperactive. Each child was rated by two teachers and the subsequent factor analysis of responses yielded one factor accounting for 70.7% of the variance. "All items entered significantly into the single factor of attention as measured by the ACL" (Melnyk, 1988, p. 41).

Das and Melnyk (1989) related the ACL to one of the shorter forms of the Conners Scale, which has ten

items (Conners 1969). The Attention Checklist (ACL) and the abbreviated Conners Scale were found to have a high correlation of (.84) for the EMH sample, although the ACL has no items that refer specifically to impulsivity or conduct problems.

The two scales were factor analyzed, and the factor analysis of the ACL yielded only one factor, explaining 70.7% of the variance. All items had significant loadings on this single factor ranging from (.72) to (.90). In contrast, the Conners Scale yielded two factors. The first factor, which accounted for 66.2% of the variance, incorporated the first seven items of the scale and was representative of hyperactivity, inattentiveness and impulsivity. The second factor, which accounted for 12.2% of the variance, incorporated the last three items of the scale and represented temperament.

Next, the two scales were taken together in a factor analysis and three factors were obtained. The first factor accounted for more than 63% of the variance and it comprised all the items of the ACL and two items of the Conners Scale. These same two items of the Conners Scale had previously been identified by Brown (1986) as comprising the attention factor of that

rating scale. The second factor which emerged from the analysis of the two scales comprised 8% of the variance and was identified as the emotional lability/conduct factor. The third factor, which accounted for 6% of the variance, was identified as the temperament factor. Thus, Melnyk's study validated the ACL as a unitary scale for rating attentive and inattentive behavior, without reference to conduct disorder or hyperactivity (Das & Melnyk, 1989).

> "Despite the apparent difference in the attributes that the items in the two scales assess, the total scores are highly correlated (r = .84). This may suggest that AD-HD is a unitary syndrome, with attention being the most problematic area for the children labeled as hyperactive."(Das & Melnyk, 1989, p. 1273)

The abbreviated (ten item) Conners Scale has come under criticism ever since attention deficits have become recognized as the central feature of ADHD because diagnosticians need to focus on the identification of attentional problems apart from impulsivity or temperament (Das & Melnyk, 1989). The ACL "...Should predict deficits in selective attention among AD-HD children who are not mentally handicapped,

but that remains to be empirically verified." (Das & Melnyk, 1989, p.1273.)

A further study by Das et al., (1992), did administer the ACL to children of average range IQ. In this study, 49 children in grades three, four, and six were rated by teachers using both the ACL and the 24 item revised Conners Scale (CTRS-R). This Conners scale has been shown to be composed of three factors, Conduct Problems, Hyperactivity, and Inattention / Passivity. As Predicted, the ACL correlated highly (.86) with the inattention/passivity subscale of the CTRS-R.

A subsequent principal components analysis of the two rating scales yielded two components - attention, and one, "...best described as a psychopathology factor." (Das et al., 1992, p. 42) The ACL loading on the attention factor was .94. "The results imply that teachers can rate the attentional component separately from the hyperactivity ...(and conduct problem) component." (Das et al., 1992, p. 42)

These results further validate the ACL as a valid screening device for attentional problems with a sample of 49 regular elementary school children.

A second objective of Melnyk's original study (1988) was to validate the ACL as a predictor of performance on attention tasks. Sustained attention was measured by a simple vigilance task and selective attention was measured by modified Posner's physical and name matching tasks. The hypothesis tested related to the information processing demands of the two tasks. Simple vigilance was presumed to be less demanding than the Posner's tasks, thus the Posner-like tasks were expected to differentiate the two groups. It was hypothesized that within the Posner task, name-matching would discriminate even more than physical matching.

"The mentally handicapped adolescents identified as Good Attenders by the rating scales significantly outperformed those identified as Poor Attenders on the selective attention task" (Melnyk, 1988, p. 57). The cognitively less demanding vigilance task, as predicted, failed to discriminate between groups (Melnyk & Das, 1992). They concluded that the factor which seems to be sensitive to teachers' ratings is resistance to distraction. "Our data suggests that the ratings are guided by the differences among the students' capacity for inhibiting responses to distractors during classroom instruction" (Melnyk &

Das, 1992, p. 605). The teacher responses on the ACL were reliable and predictive of performance on tests of attention.

The Das et al. (1992) study which involved 49 regular class students in grades three, four, and six, also examined the relationship between teachers' ratings of attention among their students and the performance of those students on tests of selective attention. All 49 students were given the individual performance tasks. The authors discovered a "significant association" between the ACL ratings and the Stroop interference scores and the commission errors on an auditory selective attention task. They too suggest that the ACL elicits responses which evaluate a child's resistance to distraction.

In this study, the ACL corresponded highly (.86) with the Inattention/Passivity subscale of the CTRS-R, but it didn't correspond with all of the selective attention tasks equally well. The correlation between the ACL ratings and performance on individual attention tasks was as follows: (Stroop interference) Expressive Attention (.46); (Posner) Physical Match (.15), Name Match (.07); Vigilance A omissions (.12), Vigilance A commissions (.37); Vigilance B omissions (.14),

Vigilance B commissions (.21). (Das et al., 1992) The ACL corresponded moderately with false detections, but not with omissions. These authors concluded that if the ACL predicts anything, it predicts resistance to distraction. A subsequent comparison of the ACL with selective attention tasks is warranted.

The ACL has thus far shown strong discriminative ability. With Melnyk's 1988 study involving mentally handicapped adolescents, the students identified as poor attenders also performed poorly on the selective attention task of physical matching. In the Das et al., (1992) study, the ACL discriminated among average range cognitive ability students. and, those who ranked as poor attenders on the ACL subsequently demonstrated difficulty on the Stroop interference task and an auditory vigilance task.

These two studies establish that the ACL is a rating scale which evaluates a child's resistance to distraction.

The ACL has thus far shown to discriminate among students, both of regular cognitive ability, and of delayed cognitive ability. The high and low groups as identified by the ACL differ in their resistance to distraction as measured by certain performance tasks.

As described below, the CAS may have some tasks which measure resistance to distraction. That hypothesis will be examined in Study Two.

Cognitive Assessment System

The Cognitive Assessment System was developed by Das and Naglieri over the past two decades as an alternate approach to measuring intelligence.

> The verbal-nonverbal model used by Wechsler (e.g., in the WISC-R, 1974) is limited as a measure of cognitive competence because the verbal-nonverbal content model assesses what subjects know but not what they can do with what they know (planning) ... nor does it measure attention ... (Naglieri et al. 1991, pp. 14-15).

Their PASS model (Planning, Attention, Simultaneous and Successive cognitive processes) is the result of efforts to develop an intelligence test based on a psychological theory of intelligence (Naglieri et al., 1990). That theory evolved from the work of A. R. Luria and is described in detail by Naglieri and Das (1990), (1986). Their intention was to provide a more "thorough instrument" for examining cognitive processes.

The CAS has an attention scale, a simultaneous and a successive processing scale and a planning scale. "The majority of research conducted to 1979 concerned the two types of processing that take place in the coding system, simultaneous and successive coding. ... More recent research has examined the roles of arousal, especially in attention ... and planning ..." (Kirby & Das, 1990, p. 320).

Discriminant validity studies are reported in Naglieri and Das (1990), and Naglieri et al., (1990). The factor analysis of tasks is presented in Naglieri et al., (1991). The construct and criterion related validity of the experimental tasks leading up to the development of the CAS is presented in Naglieri and Das, (1987). The CAS is currently being analyzed and validated by the Riverside Publishing Company, Chicago, who are preparing the CAS for publication.

In summary, Melnyk's study (1988) established the ACL as a rating scale with a unitary factor: attention. The Das et al. (1992) study further validated the ACL as a screening device for rating attentive and inattentive behavior without reference to conduct disorder or hyperactivity. It also extended the validity to children of average range cognitive

ability. The current study hopes to confirm, with a larger homogeneous sample of children of average cognitive ability, that the ACL is a valid and reliable screening instrument for attentive and inattentive behavior.

CHAPTER 4

Study One

Validation of the Attention Checklist as a Screening Device for a Regular School Group.

Introduction

The knowledge about Attention Deficit Disorder has increased in the past two decades. Previous instruments which were relied upon for diagnosis are perhaps less useful now that our knowledge has increased. "...The core symptom is an inherent weakness in the ability to concentrate on relevant tasks and to maintain attention until the task is completed." (Moghadam, 1988, p. 1) Any one of the four versions of the Conners scales was a popularly used screening device in the 1980's, but these scales have been proven valid for evaluating conduct problems, not inattentive behavior (Barkley, 1990). The Attention Checklist was developed by Das in 1986 as a screening device for attentional deficits without reference to hyperactive behavior. Das perceived a need for an instrument which could effectively identify attentional problems apart from impulsivity or temperamental factors (Das & Melnyk, 1989). The Melnyk (1988) study and the Das et al. (1992) study as discussed previously

in Chapter 3 established this attentional focus of the ACL.

The intention of this study is to further validate the ACL as a screening instrument for the regular school population.

In this study, the ACL was completed by two teachers for each child and the results were analyzed to determine the number of factors evident, and to determine the inter-rater reliability.

Method

Subjects. The subjects were 110 grade four children from three school districts in rural areas north of Edmonton, Alberta. The 126 children in the combined grade four population comprised 66 girls and 60 boys. Age and standardized test results were obtained from the cumulative files of these children. Of this original population, sixteen were excluded from the study: five girls and six boys were excluded because there was no standardized information available; two boys and two girls were excluded because standardized test results placed them below the average range (below the 21 percentile rank); one boy was excluded because teachers reported emotional instability. The remaining population of 110 children

Table 1

Age Range and Mean for Total Population of Study One

Group	n	Age Range (Years-months)	Mean Age	SD
Males	51	9 - 4 to 11 - 9	10.1	5.3
Females	59	9 - 4 to 11 - 5	10.0	5.8
Both	110	9 - 4 to 11 - 9	10.1	5.6

was composed of 59 girls and 51 boys. See Table I for the age range and mean of the total sample for study one.

Test. The Attention Checklist (ACL) was developed by Das (1986) and reported in Das and Melnyk (1989), Melnyk (1988), Melnyk and Das (1992), and Das, Snyder and Mishra (1992). It is a twelve item scale mixing six questions posed to represent attentive behavior and six questions to represent inattentive behavior. Questions are rated on a four point scale (scored 1-4) denoting whether the behavior is present ("not at all", "just a little", "pretty much", or "very much"). With all items, the better the attention skills, the higher the score. Possible total scores range from 12 to 48. The ACL and its scoring key appear in Appendix A.

The Attention Checklist was initially established as a rating instrument for measuring the attention of adolescent educable mentally handicapped students in the classroom. That original study compared the Attention Checklist to the Conners Abbreviated Scale and the Pearson correlation between the two scales was .84 based on 100 subjects (Das & Melnyk, 1989). The two scales were factor analyzed, and the factor analysis of the ACL yielded only one factor, whereas

the Conners Scale produced two factors, an attention factor (2 items), and a hyperactivity factor (8 items). When these two tests were combined in a factor analysis, the ACL loaded on the same factor as the two attention items of the Connors scale. The other 8 items of the Conners scale maintained a separate identity loading on a separate factor (Melnyk, 1988).

The validity of the ACL in attention assessment was further examined by using the scale to predict student performance on attention-demanding tasks, first by Melnyk (1988) with mentally handicapped adolescents and then by Das et al. (1992) with regular grade three, four and six students.

Procedure. Each student was rated by two teachers who were currently teaching the children. Since this rating was completed during the first week of June, the teachers had interacted with the children in a school setting for nine months and thus were familiar with each student's range of behaviors. The teachers were instructed to complete the checklists independently so that the responses reflected the behaviors observed by that teacher.

Results and Discussion

Attention Checklist Range of Results. The ACL has a possible range of results from 12 to 48. In this study, the results of both raters were averaged for each student. Table 2 shows the range of these averaged results and the percentage of the sample that each range encompassed. The range of results for this sample did not follow the pattern of a normal distribution. In this study, teachers perceived most students as good attenders. Fifty percent of the 110 students were rated at 37 or higher out of the possible score of 48. A possible investigation for future studies could be to investigate the distribution of range of results in other samples.

Factor Analysis. Principal component factor analysis and principal axis factoring were both used to identify the underlying attributes of the ACL. One factor accounting for over 80% of the variance was obtained.

All items entered significantly into the single factor of attention as measured by the ACL. Table 3 shows the principal components analysis and principal axis factoring for each rater and for combined results.

Table 2

Attention Checklist Range of Results

Average total scores	# of students	% of sample	cumulative %
14 to 18	3	2.7	2.7
19 to 23	6	5.5	8.2
24 to 28	10	9.1	17.3
29 to 33	15	13.5	30.8
34 to 38	30	27.3	58.1
39 to 43	17	15.5	73.6
44 to 48	29	26.4	100
15.5 to 48	110	100	

Table 3

ACL Factor Analysis

	Principal Component Analysis			
	eigenvalue	% of variance	high loading	low loading
Rater A	9.22834	76.9	.92356	.78044
Rater B	8.61468	71.8	.91454	.71115
Combined	9.91691	82.6	.94293	.84064
	Principal Axis Factoring			
	eigenvalue	% of variance	high loading	low loading
Rater A	8.98726	74.9	.92050	.75351
Rater B	8.32230	69.4	.91261	.67810
Combined	9.73166	81.1	.94090	.82072

The factor loadings were similar for each individual rater and combined ratings. One factor emerged, showing uniformity of purpose of the items. The results are presented in Table 7.

Group Differences. Teacher responses for the ACL were analyzed for the 110 students. The responses were compared by age and by gender within each age group. Table 4 shows the cross breakdown of individual item mean response scores for combined teacher ratings. Possible scores range from 1 to 4 with a high score of 4 representing good attention skills. Results were analyzed in terms of the mean item value attained by each subject on the questionnaire. The mean response for boys was lower than the mean response for girls in both age groups, indicating that in this sample, teachers perceived boys to be less attentive than girls. The mean response for students 10 years old or greater was somewhat lower than the mean response for 9 year olds, for both genders.

The main effects of age and gender showed significance in F Scores, especially with gender, with females obtaining higher scores than males. This could be interpreted to mean that these teachers perceived girls to be more attentive than boys. As well, younger

Table 4

Mean Item Scores *Attention Checklist

Gender	Age	n	M	SD
m	9 yrs.	19	2.97	0.63
f		27	3.41	0.58
both		46	3.23	.64
m	10 & 11yrs	32	2.76	0.67
f		32	3.14	0.70
both		64	2.95	0.71
m	9, 10, &11	51	2.84	0.66
f		59	3.26	0.66
both		110	3.06	0.69

*Mean scores based on item value (range: 1 to 4). Table 8 mean scores represent entire ACL mean value (12 times higher).

students obtained higher scores than older students, which could indicate that these teachers' expectations of students changed with the age of the students. However, the age difference was barely significant ($p = 0.056$). It is possible that the older students didn't measure up to the teachers' higher expectations of them. Some opponents of school retention would suggest that older students adopt immature behaviors to fit in with younger students. Girls were perceived to be better attenders regardless of age, thus there was no significant interaction between age and gender. (See Table 5) Further research on this aspect of age range and attention within a group might be warranted.

Inter-rater Correlations. The responses on each of the twelve items of the ACL were compared for both raters for each of the 110 students. The resulting correlation between raters can be seen in Table 6. The overall inter-rater correlation of .75 is high when one considers that 12 teachers from three school districts were involved in this study. The ACL was completed during the first week of June, thus the teachers had interacted with the children in a school setting for nine months and thus were familiar with each students range of behaviors. This high inter-rater

Table 5

Analysis of Variance - Attention Checklist n = 110

source of variation	sum of squares	DF	Mean Square	F	Sig of F
main effects	6.59	2	3.29	7.72	0.001
age	1.60	1	1.60	3.75	0.056
gender	4.48	1	4.48	10.49	0.002
two way interactions					
age - gender	0.03	1	0.03	0.06	0.805

Table 6

Inter -rater Correlation n = 110

Item	Correlation
1. Does the child have a short attention span?	.67
2. Does the child appear detached from class activities?	.57
3. Does the child accurately heed directions?	.50
4. Does the child daydream in class?	.51
5. Does the child have trouble concentrating?	.62
6. Does the child stay with one activity long enough to complete it?	.65
7. Does the child work independently?	.56
8. Is the child easily distracted?	.53
9. Is the child able to concentrate on a task until completed?	.60
10. Does the child listen attentively?	.54
11. Does the child become easily engrossed in an activity?	.52
12. Does the child disregard some or all directions?	.52
Overall	.75

correlation establishes the ACL as a reliable screening instrument for attentive and inattentive behaviors.

Comparisons with Previous Studies

Melnyk (1988). The 1988 study by Melnyk examined the ACL for factor structure and predictive validity. In that study, 15 teachers rated 100 mentally handicapped adolescents using the ACL. That sample consisted of 54 males and 46 females who attended a specialized junior/senior high school. The chronological age of these students ranged from 12 to 17 years with a mean age of 14.4 for the sample (Melnyk, 1988).

The factor analysis of the ACL yielded one factor which accounted for over 70% of the variance. As reported in Das & Melnyk, 1989, "... All items had significant loadings on this single factor ranging from .72 to .90" (p. 1271).

Table 7 presents a comparison of the item loadings on the original study and the current study. The loadings are similar with the current study results being consistently higher. This could be due to the different cognitive abilities of the two samples. In both studies, only one factor emerged and all items of the scale loaded strongly on that factor.

Table 7

Attention Checklist with Factor Loadings

Item	Melnyk n=100	Current n=110	
	PCA*	PCA*	PAF**
1. Does the child have a short attention span?	.90	.92	.92
2. Does the child appear detached from class activities?	.74	.91	.90
3. Does the child accurately heed directions?	.72	.91	.90
4. Does the child daydream in class?	.72	.84	.82
5. Does the child have trouble concentrating?	.89	.94	.93
6. Does the child stay with one activity long enough to complete it?	.87	.93	.92
7. Does the child work independently?	.87	.91	.90
8. Is the child easily distracted?	.86	.91	.90
9. Is the child able to concentrate on a task until completed?	.88	.94	.94
10. Does the child listen attentively?	.90	.92	.91
11. Does the child become easily engrossed in an activity?	.85	.90	.89
12. Does the child disregard some or all directions?	.84	.88	.86
% of variance	70.7	82.6	81.1

* PCA Principal Component Analysis **PAF Principal Axis Factoring

Das, Snyder & Mishra (1992). In a study conducted by Das, Snyder and Mishra, 49 students in regular classes of grade three, four, and six were rated by teachers using the ACL. That study was similar to the current study in that the students were of average range cognitive ability in the regular school stream. In contrast to the current study, the age range of that sample was from 8 to 12 years and the grade range was from three to six.

The mean teacher ratings and standard deviations for each study can be seen in Table 8. These mean ratings are based on the total scores of each student for the entire checklist with a possible range of scores from 12 to 48. (Table 4 presented mean scores based on individual item values which ranged from 1 to 4. Thus Table 4 values are $1/12^{th}$ of table 8 values.)

It is important to note the different cognitive ability of the samples: Melnyk: mentally handicapped; Das et al.: average range; and current study: average range. It is also important to note the different age ranges of the samples and the different sizes. Keeping these differences in mind, there is strong similarity in mean scores.

Table 8

Attention Checklist Mean Scores

Gender	Age	n	Mean	SD
Current Study				
M	9	19	35.6	7.6
F		27	40.9	7.0
Both		46	38.7	7.6
M	10&11	32	33.1	8.1
F		32	37.6	8.4
Both		64	35.4	8.5
M	9-11	51	34.0	7.9
F		59	39.1	7.9
Both		110	36.8	8.3
Melnyk, 1988				
M	12-14	29	33.4	10.9
F		29	33.1	8.7
Both		57	33.3	9.8
M	15-17	25	31.2	8.6
F		18	35.8	8.8
Both		43	33.1	8.9
M	12-17	54	32.4	9.9
F		46	34.2	8.8
Both		100	33.2	9.4
Das, Snyder, & Mishra, 1992				
Grade 3		16	33.5	6.6
Grade 4		21	37.7	6.8
Grade 6		12	38.2	8.1

For each study, the mean ACL score was in the mid to high 30's (possible high: 48) with one exception. The nine year old girls of the current study had a mean ACL score of 41. This general similarity of mean ACL scores indicates that the teachers' relative rankings in each group resulted in very comparable mean scores.

The distribution of scores in the Das, Snyder, Mishra study is also very similar to the distribution of scores in the current study (see table 9). In the current study, 68% of the 110 students had ratings of 34 or higher; in the Das et al. study, 68% of the 49 students had ratings of 33.5 or higher.

This distribution of scores, skewed to the high end, indicates that teachers perceive most students to be good attenders. Only six to eight percent of the students in these two studies were rated as poor attenders (having scores of 23 or less). This is in line with current data that estimates an incidence of attention problems of approximately 3% to 15% (Whalen & Henker, 1991), or, 3% to 5% (Breen, 1990) in school populations. This study used 27.5 as an arbitrary cutoff point which included about 15% of the total sample as subjects for the performance tasks.

Table 9

Attention Checklist - Comparative Range of Results

Das, Snyder, & Mishra (1992)

Range of Scores	No. of Students	% of Sample	Cumulative %
18 to 23.1	3	6.122	6.122
23.1 to 28.3	3	6.122	12.244
28.3 to 33.5	9	18.367	30.611
33.5 to 38.6	16	32.653	63.264
38.6 to 43.8	8	16.327	79.591
43.8 to 49	10	20.408	100
18 to 48	49	100	

Current Study

Average total scores	# of students	% of sample	cumulative %
14 to 18	3	2.7	2.7
19 to 23	6	5.5	8.2
24 to 28	10	9.1	17.3
29 to 33	15	13.5	30.8
34 to 38	30	27.3	58.1
39 to 43	17	15.5	73.6
44 to 48	29	26.4	100
15.5 to 48	110	100	

Summary and Conclusions of Study One

As in the original study, the ACL yielded only one factor , "Thus, the ACL is a unitary scale for rating attentive and inattentive behavior in the classroom" (Das et al., 1992, p. 38). The original study validated the ACL with ratings of mentally handicapped adolescents. This study involved regular grade four students in Alberta elementary schools. Thus the ACL has been further validated and extended to a population of average range elementary school children.

The inter-rater reliability for the whole group (110) is .75, supporting the use of the ACL as a screening instrument in a regular school setting for assessing the extent to which a child resists distraction.

The teachers who completed the checklist (ACL) generously did so on their own time, but reported that it was not a burdensome task.Most of them were able to evaluate their class of students in one uninterrupted sitting.Because they completed the ACL in June, they knew their students well and this confidence probably contributed to the ease of rating. Perhaps early in the school year, teachers would have to deliberate longer over each item for each student. It is highly

probable that the June completion of the ratings also contributed to the high inter-rater reliability.

When less attentive students have been identified, teachers could refer these students to the school psychologist for an individual assessment. Because shrinking budgets have less money for resource room pull-out instruction, or special education intervention, it is becoming more common for classroom teachers to be expected to meet a wider range of needs. The ACL can serve as a screening resource for classroom teachers, so that students who may be less attentive can be assessed further. Ideally, this further assessment will result in specific strategies for the classroom teacher to use.

CHAPTER 5

Study Two

Performance Measures of Attention and Their Relation to the Attention Checklist

Introduction

The second purpose of this study was to determine to what extent the teacher ratings of classroom behavior, as measured by the ACL, were related to the child's performance on objective measures of attention. Because the ACL is a unitary scale measuring one factor which has been labeled attention, it was predicted that the children who were rated as good attenders would perform well on objective measures of selective attention, and, the children who were rated as poor attenders would perform comparatively worse on the same measures of selective attention.

Method of Selection of Subjects

For each of these 110 children, the results of the ACL were summed and the two raters scores were averaged. The results were ranked from a high of 48 to a low of 15.5 . The intention was to administer the tasks to the children who ranked as the top 15 and the bottom 15 individuals in terms of the teacher responses to the attention checklist.

Seventeen children were rated with top scores of 48, 47.5, or 47. Parental consent was obtained for 16 of these children to participate in the tasks. One of these children was absent on one day of the testing, so complete data was obtained from 15 of the top ranked students. Of the eighteen students who had teacher ratings ranging from 15.5 to 27.5, parental consent was obtained from 15 and complete data was obtained from these 15 students.

The 30 students ranged in age from nine years, four months, to eleven years (mean age 10-0). The low-rated fifteen students ranged in age from nine years, nine months to eleven years (mean age 10-2) and was made up of ten boys and five girls. The high-rated fifteen students ranged in age from nine years, four months to ten years, four months (mean age 9-11) and was made up of twelve girls and three boys.

Tasks: The Cognitive Assessment System (CAS).

The Cognitive Assessment System (CAS) was developed by J. P. Das of the University of Alberta, and J. A. Naglieri of Ohio State University in the 1980's. It is based on Luria's conceptualization of human intellectual functioning and consists of four major scales: Planning, Attention, Simultaneous

Processing and Successive Processing (Naglieri & Das, 1990). Validation studies of the CAS have been reported by Naglieri et al. (1991), Das and Naglieri (1992), and Kirby and Das (1990).

The attention component of the CAS (appropriate to children over age eight) was administered to the 30 subjects. These tasks of selective attention were presented in the visual mode and in the auditory mode. The visual tasks had varying degrees of complexity - that is, the information-processing demands varied from task to task. These attentional tasks of the CAS "...all require the individual to attend selectively to one and not another aspect of a two dimensional stimulus. ... These tasks always involve a competing stimulus that is as salient or more malient than the target stimulus." (Naglieri & Das, 1990)

Expressive Selective Attention. This test developed by Das and Naglieri is similar to the Stroop test (Naglieri et al., 1991) and consists of three parts. In the first part, students were presented with a sample card containing the words "blue", "red", "green", and "yellow", printed in black ink on a white background. The children were instructed to read these words as quickly as possible. Then they were presented

with the test page containing five columns of eight words to be read as quickly as possible.

The second part of this task was of similar presentation style and consisted of rectangular bars in the colors red, blue, green, and yellow, and the colors were to be named as quickly as possible.

The third part of this task combined the first two conditions and placed more demands on the respondent. The words, "blue", "green", "red", and "yellow", were printed in a color different from the name suggested by the word. This task presented interference due to the contrasting color of the print and the word. It demanded a suppression of the reading of the word because the task was to name the color of the ink. The number of correct responses and the time elapsed were the two factors recorded on these tasks. These Stroop tasks involve increasing complexity, sequential reasoning, motor planning and execution, and, frustration tolerance (Klee, 1986).

Receptive Selective Attention. This paper and pencil version of Posner's task (Posner & Boies, 1971) consisted of two trials in each of two conditions, physical and name matching. The subject was instructed to find and circle letter pairs that were the same,

first as a physical match (NN), then as a name match (Nn). The first trial was an instructional/practise trial and the second trial was a timed exercise with the subject aware of the two minute time limit. The number of correct selections and the time elapsed were also the factors recorded on these tasks.

Visual Selective Attention. The test, Number Finding, required the subject to find and underline specific numbers within rows of numbers that contained both targets and distractors. Two conditions of this task were presented. In the first presentation, the targets were the digits "1", "2", and "3", in a specific style of print. All other digits could be ignored and the digits "1", "2", and "3", in any other style of print were to be ignored.

In the second phase of this task, the interference and information processing demands increased by enlarging the scope of targets to underline. The digits "1", "2", and "3", were targets in one style of print, while the digits "4", "5", and "6", were targets in a different style of print. The subjects were aware of a 90 second time limit during both conditions. Scores were based on the number of correct responses and the time elapsed.

Auditory Selective Attention. The fourth part of the CAS employed in this study was a complex vigilance type task. It required the subject to listen to a tape recording of words presented at a rate of one per second over a five minute period and to respond by tapping on the table when a signal word was heard. The children were required to respond when they heard a man's voice say, "cat", "dog", "mouse", "tiger", or, "rabbit" (animal words), and the woman's voice say, "bed", "chair", "lamp", "table", or, "sofa" (furniture words). The opposite combinations of voice and category were to be ignored. This task was scored for omission errors (the number of signal words ignored by the subject) and commission errors (false detections).

Tasks: The Wechsler Intelligence Scale for Children - Third Edition (WISC-III).

Perceptual Speed Index. The two subtests of the WISC-III which comprise the Perceptual Speed factor, Coding and Symbol Search, were administered. The Coding subtest is the same as it was in the WISC-R. It is a paper and pencil task where the child must copy symbols associated with specific numbers. The Symbol Search subtest is also a paper and pencil task but fine motor control is not as crucial. The child must

scrutinize a row of symbols and if it contains either of two target symbols, the instructions are to check the "yes" box; if neither target symbol appears in this row of symbols, the instructions are to check the "no" box. As well as requiring visual selective attention, these are timed tasks with a two minute time limit.

Freedom from Distractibility Index. The two tasks which make up the Freedom From Distractibility factor in the WISC-III, Arithmetic and Digit Span, were administered as well. These tasks have some content changes from the WISC-R, but the format remains the same. These are both tasks requiring auditory attention.

Procedure:

Two teachers individually completed the Attention Checklist (ACL) for each of the 110 grade four students. The results were averaged for each student and these averaged scores were ranked. Written parental consent was obtained for the 30 students (top and bottom 15 of the ranking order) to then participate in individual tasks.

The individual tasks were completed at the child's school in a quiet setting during regular school hours in mid June. Individual tasks were completed in the

morning or during the first hour of the afternoon. Testing never extended into recess, and did not occur on Friday.

After a brief opportunity to become comfortable with the examiner and the surroundings, the testing began with the tasks from the CAS. The first testing session required about 30 minutes per child. On a second occasion the subtests of the WISC-III were administered. This second session required about 20 to 25 minutes per child. Before returning to class, each child was asked not to tell peers specifically what sort of activities were done so that if they still were to come they wouldn't have an advantage. They were told that they could talk to their peers about whether it was fun or not.

Results and Discussion:

The responses on the ACL successfully identified children who have difficulty maintaining focused attention over a variety of tasks. There was a significant discrimination between groups on almost all tasks.

Expressive Selective Attention. In all three parts of this version of the Stroop (1935) test, the number of items correct did not discriminate between

the groups. All of the students were able to provide the correct response whether it involved reading words or naming colors.

The other variable, time taken to complete the task, did significantly discriminate the high attenders from the low attenders. Whether it demanded decoding skills to read the word, or color naming skills, or a suppression of the decoding skills in the interference task, the high attenders performed significantly faster than the low attenders. Each of these tasks took increasing lengths of time for both the high attenders and the low attenders. The children were fastest at decoding the words which were printed in black type on white paper (mean time 18 seconds for high attenders or 23 seconds for low attenders). Both groups of children took longer to name the bars of colors (mean time 29 seconds or 36 seconds). When asked to suppress the impulse to read the words and instead name the color that the word was printed in, that process took longer for both groups (mean time 53 seconds or mean time 76 seconds).

In order to control for individual differences in speed of identifying colors and reading words, two ratios were calculated. Ratio 1 compared the groups

when controlling for differences in the time it took to name the colors [(cw - c)/(cw + c)]. The groups still differed significantly. Ratio 2 compared the groups when controlling for differences in the time it took to decode [(cw - c)/(cw + c + w)]. The difference here was significant as well. This elimination of differences due to reading or naming speeds indicates that the selective attention of the low rated group was not as strong as the selective attention of the high rated group. By grade four, reading has become such an automatic process that these children read words faster than they could name colors, and when they had to suppress the decoding of the word in order to name the color of the ink, the low rated attenders needed significantly more time to do so. Their selective attention was not as strong as the good attenders' (see table 10).

Receptive Selective Attention. In this modified Posner's task, students had to identify letter pairs that were the same, first as a physical match (NN) and then as a name match (Nn). The results were significantly different for the two groups in three of the four conditions. (See table 10).

Table 10

t Values of Performance Tasks

Task	Good Attenders		Poor Attenders		t Value	2 tailed probability
Expressive Attention	M	SD	M	SD		
Stroop word reading (time)	18.48	3.8	23.0	4.8	2.9	0.007
Stroop word reading (correct)	39.8	0.4	39.9	0.3	1.1	0.301
Stroop color naming (time)	29.5	8.7	36.2	7.5	2.2	0.003
Stroop color naming (correct)	39.9	0.4	39.7	0.6	1.1	0.287
Stroop interference (time)	53.2	12.5	76.2	17.8	4.1	<0.001
Stroop interference (correct)	39.4	0.9	39.0	1.4	1.0	0.354
Ratio 1	0.29	0.06	0.35	0.09	2.1	0.044
Ratio 2	0.24	0.05	0.29	0.08	2.2	0.038
Receptive Attention						
Posner's physical match (time)	106.0	12.4	115.7	8.9	2.5	0.021
Posner's physical match (correct)	47.2	2.5	41.3	5.7	3.7	0.002
Posner's name match (correct)	30.8	3.1	23.1	5.2	5.0	<0.001
Visual Selective Attention						
Number finding (simple) (time)	73.5	13.1	81.6	9.1	2.0	0.061
Number finding (simple) (correct)	43.3	3.3	41.7	4.6	1.1	0.281
Number finding(complex)(correct)	16.7	2.6	14.1	3.8	2.1	0.040
Auditory Selective Attention						
Auditory omissions	27.2	10.0	33.1	8.2	1.7	0.111
Auditory commissions	8.2	5.4	12.8	5.3	2.2	0.038
WISC III subtests						
Coding	13.5	3.2	8.5	2.6	4.7	<0.001
Symbol Search	14.4	2.9	9.3	3.0	4.7	<0.001
Perceptual Speed Factor	120.9	13.6	95.5	11.7	5.4	<0.001
Arithmetic	11.2	3.2	7.5	2.5	3.6	0.001
Digit Span	11.9	3.1	8.2	2.2	3.7	0.001
Freedom fr Distractibility Factor	109.4	14.9	88.7	9.3	4.6	<0.001

When performing the physical matching task (NN), the high attenders got more correct and more quickly than the low attenders. When performing the name matching task (Nn), both groups ran out of time (2 minute maximum) without completing the task, therefore, the time factor did not discriminate between the two groups. This time factor is an indication of the greater degree of difficulty between the two tasks. Simply selecting pairs of identical symbols was a much less complex task than identifying letters in their uppercase and lowercase forms. The groups were significantly different in their number of correct responses with the high attenders having a mean score of 30.8 out of 50 and the low attenders having a mean score of 23.1 out of 50. This varying amount of correct responses is probably a factor of speed of visual scanning with the children with stronger selective attention ability able to examine more items in the allotted time.

In order to examine these two tasks for the difference in performance between simple and complex tasks, an analysis of variance was conducted. Group 1 and group 2 did perform significantly differently from each other, and the two tasks had significantly

Table 11

Analysis of Variance in Receptive Attention Tasks (Posner)

Source	Degrees of Freedom	Mean Squares	F Ratio	Probability
A) High-Low Attenders	1	693.633	22.694	0.001
S-within	28	30.565		
B) Physical Match / Name Match	1	4506.680	633.111	0.001
AB) Interaction	1	13.008	1.827	0.187
BS-within	28	7.118		

different results even when all students were considered as one group. (See table 11). There was not a significant interaction between the groups and the tasks. Increasing the complexity of the tasks did not increase the difference in performance between the groups.

Visual Selective Attention. The Number Finding task resulted in significant differences between the groups in speed but not in amount correct when the task was simple. When the task increased in complexity, both groups ran out of time, so, time was not a discriminating factor in the complex task, but, the groups differed significantly in the number of correct responses within that time (See table 10).

In order to examine these two tasks for the difference in performance between simple and complex tasks, an analysis of variance was conducted. The difference in performance between group 1 and group 2 approached significance, and the two tasks had significantly different results when all students were considered as one group. (See table 12). There was not a significant interaction between the groups and the tasks. Again, increasing the complexity of the tasks

Table 12

Analysis of Variance in Visual Selective Attention (Number Finding)

A) High-low attenders	1	66.149	3.881	0.059
S-within	28	17.043		
B) Number Finding (Simple / complex)	1	10962.012	1155.049	0.001
AB) Interaction	1	3.754	0.396	0.535
BS-within	28	9.491		

did not increase the difference in performance between the groups. The simple level was adequate to separate the groups.

Auditory Selective Attention. This task had two scores, omission errors and commission errors (false detections). The high and low attenders did not differ clearly on errors of omission, but they did differ significantly on commission errors (see table 10) with the high attenders having fewer commission errors than the low attenders. Both groups had members who found this task extremely frustrating. One member of each group could not proceed to the task in spite of several practice opportunities. One member of each group discontinued the activity before completion due to frustration with the task. Interestingly, some members of each group developed strategies to cope with the complexity of the task.

A minute by minute breakdown of performance on this test shows a general trend for omission errors to increase over time. The sharpest increase occurred in minute two for both groups (see table 13).

Table 13

Auditory Selective Attention - Minute by Minute

	Omission Errors Mean Score				
Source	M 1	M 2	M 3	M 4	M 5
High Attenders	3.9	5.0	5.9	5.9	6.4
Low Attenders	5.4	6.8	6.8	7.2	7.0

	Commission Errors Mean Score				
Source	M 1	M 2	M 3	M 4	M 5
High Attenders	2.5	1.8	1.6	1.3	0.9
Low Attenders	2.9	3.2	2.7	2.3	1.8

The high attenders improved consistently over time on the avoidance of false detections or commission errors (see table 13). The low attenders had an increase of commission errors (false detections) in minute two and then a steady decrease in false detections. These results indicate that the high attenders were more efficient at selecting the appropriate stimuli to respond to and more efficient in suppressing a response to distracting stimuli. Their decline in correct detections over time leads to a variety of speculations. Perhaps the good attenders place more emphasis on avoiding errors and thus don't risk as many false detections. Perhaps they gradually lost interest or motivation during the task and generally responded less often. Perhaps they are less efficient with sustained attention but this seems improbable in light of the decline in false detections.

The results of an analysis of variance examining the comparative group performances and the minute by minute performance of all students can be found in table 14. The groups did differ significantly when commission errors (false detections) were examined. The children rated as better attenders had fewer false detections that the children rated as poor attenders.

Table 14

Analysis of Variance in Auditory Selective Attention

	Omission Errors			
Source	Degrees Freedom	Mean Squares	F Ratio	Probability
Good vs Poor Attenders	1	45.608	2.741	0.111
S Within	24	16.638		
Minute by Minute Breakdown	4	17.627	3.936	0.005
Interaction	4	1.396	0.312	0.869
S Within	96	4.478		

	Commission Errors (False Detections)			
Source	Degrees Freedom	Mean Squares	F Ratio	Probability
Good vs Poor Attenders	1	27.692	4.802	0.038
S Within	24	5.767		
Minute by Minute Breakdown	4	7.892	4.361	0.003
Interaction	4	0.769	0.425	0.79.
FS Within	96	1.810		

WISC-III Tasks. The performance on selected tasks of the WISC-III was also examined. The students were still grouped as good attenders and poor attenders, as designated by responses on the ACL. Their performance on the tasks, Coding and Symbol Search, which make up the Processing Speed Index, and, the tasks , Arithmetic and Digit Span, which make up the Freedom from Distractibility Index of the WISC-III were compared. There was a significant difference in mean scores between the highly rated attenders and the low rated attenders on all task and index scores with good attenders having higher scores (see table 15). This could be interpreted as further evidence that ability to maintain focused attention is an essential aspect of cognitive ability.

Examination of these scores also reveals that there is a wide range of performances within each group on each task. The middle 50% of each group does not overlap on the WISC-III tasks but the bottom 25% of the good attenders and the top 25% of the poor attenders did have scores which overlapped the other group's performance.

Table 15

Relationship of ACL to WISC-III Tasks

Task	Source	n	min / max	M	SD	n	t value	Proba-bility
Coding	ACL High	15	7-18	13.5	3.2	30	4.66	<0.001
	ACL Low	15	3-13	8.5	2.6			
	Total	30	3-18	11.0	3.9			
Symbol Search	ACL High	15	10-19	14.4	2.9	30	4.71	<0.001
	ACL Low	15	5-15	9.3	3.0			
	Total	30	5-19	11.9	3.9			
Perceptual Speed Index	ACL High	15	93-137	120.9	13.6	30	5.45	<0.001
	ACL Low	15	75-114	95.5	11.7			
	Total	30	75-137	108.2	18.0			
Arithmetic	ACL High	15	6-17	11.2	3.2	30	3.58	0.001
	ACL Low	15	4-13	7.5	2.5			
	Total	30	4-17	9.3	3.4			
Digit Span	ACL High	15	6-17	11.9	3.1	30	3.70	0.001
	ACL Low	15	5-13	8.2	2.2			
	Total	30	5-17	10.0	3.3			
Freedom from Distractibility	ACL High	15	84-131	109.4	14.9	30	4.56	<0.001
	ACL Low	15	69-104	88.7	9.3			
	Total	30	69-131	99.1	16.1			

Comparison with Previous Studies

Das, Snyder & Mishra (1992). In a study conducted by Das, Snyder and Mishra, 49 students in regular classes of grade three, four, and six were rated by teachers using the ACL. They were individually administered a battery of attention tests, some of which were also used in the current study. That study was similar to the current study in that the students were of average range cognitive ability in the regular school stream. In contrast to the current study, the age range of that sample was from 8 to 12 years and the grade range was from three to six.

The mean test scores and standard deviations for each study can be seen in Table 16.

In spite of the above mentioned differences in age and grade of subjects, there is a remarkable similarity in the results of these two groups on the attention tasks. Two studies, conducted in different years, by different authors, resulted in the ACL discriminating between poor and good attenders who then performed very similarly (poor to poor attenders and good to good attenders) on tasks of selective attention.

Table 16

Comparative Means and Standard Deviations of Attention Tests

Test	Current Study								
	Low Attenders			High Attenders			Total Group		
	n	M	S D	n	M	S D	n	M	S D
Expressive Selective Att. Color (time)	15	76.23	17.85	15	53.22	12.45	30	64.72	19.12
Receptive Selective Att. Physical Match (time)	15	115.71	8.91	15	106.03	12.40	30	110.87	11.69
Auditory Selective Att. Omission	13	33.08	8.18	13	27015	9.97	26	31.54	10.47
Auditory Selective Att. commission	13	12.85	5.32	13	8.23	5.41	26	10.61	5.92

Test	Das, Snyder, Mishra, 1992								
	Low Attenders			High Attenders			Total Group		
	n	M	S D	n	M	S D	n	M	S D
Expressive Selective Att. Color (time)	16	68.13	11.81	16	53.50	10.55	49	64.14	13.93
Receptive Selective Att. Physical Match (time)	16	115.19	19.95	16	104.75	21.63	49	111.16	24.07
Auditory Selective Att. Omission	16	27.00	11.66	16	24.13	11.48	49	26.71	11.86
Auditory Selective Att. Commission	16	9.88	5.30	16	6.50	4.47	49	8.04	5.17

Summary and Conclusion of Study Two

Summarizing the results of Study Two, it was found, consistent with the hypothesis guiding the study, that the good attenders performed better than the poor attenders, as designated by the ACL, on selective attention tasks. The teacher responses on the ACL correlated significantly with performance on a variety of tasks. The tasks included measures of expressive selective attention, receptive selective attention, visual selective attention, and auditory selective attention in the form of tasks from the Cognitive Assessment System. Four tasks of the WISC-III - coding, symbol search, arithmetic and digit span - also were used. The children who were rated as good attenders on the ACL, as a group, performed better on these tasks than the children who were rated as poor attenders on the ACL. The results of this study provide a strong link between the color-word, physical match, and name match tasks of the CAS and the ACL, and also between the coding, symbol search, arithmetic and digit span tasks of the WISC-III and the ACL.

This study provides a useful list of objective tests of attention which can be used by a school psychologist or other clinician for an in-depth

examination of the attentional problems of children. The results could provide valuable insight into each child's strengths and weaknesses in the area of visual or auditory attentiveness, and receptive or expressive attentivenes. This would allow teachers to know the mode likely to be most successful for each student and would identify for students areas where they must exert the most care in self-checking.

This study also serves as an examination of the WISC-III's Perceptual Speed Index and Freedom From Distractibility Index as tools in the assessment of attention. Individual performances must always be carefully analyzed, but, as a group, the (ACL identified) poor attenders experienced difficulty with these WISC-III subtests.

CHAPTER 6

Conclusion

"Attention Deficit-Hyperactivity disorder (AD-HD) (American Psychiatric Association, 1987) is a developmental disorder of age-appropriate attention span, impulse control, and rule-governed behavior (response to rules and instructions) that sometimes includes overactivity and restlessness (Guevremont et al., 1990, p. 51). The core symptom is an inherent weakness in the ability to concentrate on relevant tasks and to maintain attention until the task is completed. (Moghadam, 1988,). Several children in our schools could be affected by this disorder. Early diagnosis and intervention is essential if these children are to fulfill their potential. Educators need to have access to an effective screening device to identify children with poor attentional skills. Objective measures of selective attention need to be identified to assist with the diagnosis and to examine for remedial strategies which teachers can implement.

In the original study, (Melnyk, 1988), the ACL was used in conjunction with the Abbreviated Connors Rating Scale. Factor analysis indicated that the ACL consisted of one factor along with two items of the

Conners rating scale that had previously been designated as the attention component of that scale. The subjects of that study were mentally handicapped adolescents.

In a subsequent study, where subjects were average cognitive range elementary students (Das et al., 1992), the ACL was used in conjunction with the Conners Teacher Rating Scale-Revised (CTRS-R) and again results indicated all ACL items loaded on one factor as did the Inattention/Passivity subscale of the CTRS-R.

This study looked at the Attention Checklist and several measures of selective attention. As in the previous studies cited, the ACL yielded only one factor , "Thus, the ACL is a unitary scale for rating attentive and inattentive behavior in the classroom" (Das et al., 1992, p. 38).

The factor structure of the ACL in this study sample was expected not to differ from that generated from data in the original study, and that indeed was the result. The factor structure of this study was completely consistent with the factor structure of the original study. (See Table 7).

This study involved regular grade four students in Alberta elementary schools. Thus the ACL has been

further validated and extended to a population of average range elementary school children.

The inter-rater reliability for the whole group (110) is .75, supporting the use of the ACL as a screening instrument in a regular school setting for assessing the extent to which a child resists distraction.

The ACL is a brief (12 item) rating scale. Teachers have indicated that completing the ACL for a class of students is not a burdensome task. In spite of its brevity, the ACL has high inter-rater reliability and it effectively identifies students who have difficulties with selective attention.

The second purpose of this study was to determine to what extent the teacher ratings of classroom behavior, as measured by the ACL, were related to the child's performance on objective measures of attention. Because the ACL is a unitary scale measuring one factor which has been labeled attention, it was predicted that the children who were rated as good attenders would perform well on objective measures of selective attention, and, the children who were rated as poor attenders would perform comparatively worse on the same measures of selective attention. The results,

consistent with the hypothesis guiding the study, showed that the good attenders performed better than the poor attenders on selective attention tasks. The teacher responses on the ACL correlated significantly with performance on measures of expressive selective attention, receptive selective attention, visual selective attention, and auditory selective attention.

The auditory selective attention task was challenging for both the high attenders and the low attenders. Further examination of this task might be warranted.

This study can be criticized for taking extreme groups; that is, groups of children who were rated to be at the very high or low end of the scale. Whenever extreme groups are selected on any trait, we are also selecting inadvertently for other traits. Correlations between two measures may not be significant for the entire distribution of scores; yet extreme groups can be clearly distinguished and separated. For example, the question may arise in regard to the correlation between the WISC-III subscales, the attention tests and the ACL scores: Are there any significant intercorrelations? It could not be determined from this study as the two extreme groups could not be

legitimately combined to obtain the correlations. Even if they could be, the total number of children, 30, would be too small.

However, the extreme groups were taken to establish if the teachers' ACL ratings can discriminate children in regular classes at all, so that the ACL groupings can predict (their) scores on the attention tests and the WISC-III subscales. The present study has demonstrated that ACL ratings can do that. The next step will be to divide a large enough sample such as the one used (N > 100)into four quartiles on the ACL, subsequently examining if the four groups differ from each other on their mean performance on the attention tests and WISC-III subscales. Which adjacent groups do differ, and, which ones do not, can then be tested statistically.

Another use of taking extreme groups relates to establishing a cut-off point for poor attention as detected by the classroom teacher, so that in clinical testing of children for ADD, the cut-off point can be a valid one. This study established the cut-off point to be around 27 for ten year old regular class children. Below this point, children would be likely to perform distinctly poorly on the objective tests of attention.

The next step then, will be to try this cut-off point on groups of psychiatrically diagnosed children with ADD and the less severe cases of hyperactivity.

The relation between the psychological processes that make up "selective attention" and ACL ratings has been investigated in a previous research report (Das et al., 1992). It was then established that the ACL was related to a failure to resist distraction. WISC-III subscales have not been investigated in this manner. This study opens up that possibility; the subscales can be understood in terms of the processes underlying selective attention tests. A factor analysis of the subscales, the attention tests and the ACL will be a logical first step to unravel the attentional processes of the WISC-III subscales.

REFERENCES

Abikoff, Howard (1991). Cognitive training in ADHD children: less to it than meets the eye. Journal of Learning Disabilities, 24, 205-209.

Aks, Deborah J., & Coren, Stanley (1990). Is susceptibility to distraction related to mental ability? Journal of Educational Psychology, 82, 388-390.

Anastopoulos, Arthur D., DuPaul, George J. & Barkley, Russell A. (1991). Stimulant medication and parent training therapies for attention deficit-hyperactivity disorder. Journal of Learning Disabilities, 24, 210-218.

Atkins, Marc S. & Pelham, William E. (1991). School-based assessment of attention deficit-hyperactivity disorder. Journal of Learning Disabilities, 24, 197-204.

August, Gerald J., & Garfinkle, Barry D. 1990. Comorbidity of ADHD and reading disability among clinic-referred children. Journal of Abnormal Child Psychology, 18, 29-45.

Baker, G. B., Bornstein, R. A., Rouget, A. C., Ashton, S. E., van Muyden, J. C., & Coutts, R. T. (1991). Phenylethylaminergic Mechanisms in Attention-Deficit Disorder. Biological Psychiatry, 29, 15-22.

Balon, Richard (1990). Buspirone for attention deficit hyperactivity disorder? Journal of Clinical Psychopharmacology, 10, 77.

Barkley, Russell A. (1990). Attention Deficit Hyperactivity Disorder: A handbook for diagnosis and treatment. New York: Guilford Press.

Barkley, Russell A., DuPaul, George J. & McMurray, Mary B. (1990). Comprehensive evaluation of attention Deficit disorder with and without hyperactivity as defined by research criteria. Journal of Consulting and Clinical Psychology, 58, 775-789.

Benezra, Esther & Douglas, Virginia I. (1988). Short-term serial recall in ADDH, normal, and reading-disabled boys. Journal of Abnormal Child Psychology, 16, 511-525.

Biederman, Joseph, Keenan, Kate, & Faraone, Stephen V. (1990). Parent-based diagnosis of attention deficit disorder predicts a diagnosis based on teacher report. Journal of the American Academy of Child and Adolescent Psychiatry, 29, 698-701.

Blondis, Thomas A., Accardo, Pasquale J., & Snow, Jeffery H. (1989). Measures of Attention Deficit Part 1: Questionnaires. Clinical Pediatrics, 28, 222-228.

Blondis, Thomas A., Accardo, Pasquale J., & Snow, Jeffery H. (1989). Measures of Attention Deficit Part II: Clinical perspectives and test interpretation. Clinical Pediatrics, 28, 268-276.

Breen, Michael J. & Altepeter, Thomas S. (1990). Situational variability in boys and girls identified as ADHD. Journal of Clinical Psychology, 46, 486-491.

Brown, Candace S., Wells, Barbara G., Cold, Julie A., Froemming, Judy H., Self, Timothy H., & Jabbour, J.

T. (1990). Possible influence of carbamazepine on plasma imipramine concentrations in children with attention deficit hyperactivity disorder. Journal of Clinical Psychopharmacology, 10, 359-362.

Brown, Ronald T. (1986). Teacher ratings and the assessment of attention deficit disordered children. Journal of Learning Disabilities, 19, 95-100.

Campbell, Rebecca L. & Cohen, Morris (1989). Management of Attention Deficit Hyperactivity Disorder (ADHD). A continuing dilemma for physicians and educators. Clinical Pediatrics, 29, 191-193.

Carter, Bryan D., Zelko, Frank A., Oas, Peter T., & Waltonen, Stuart (1990). A comparison of add/h children and clinical controls on the Kaufman Assessment Battery for Children (K-ABC). Journal of Psychoeducational Assessment, 8, 155-164.

Chelune, Gordon J., Ferguson, William, Koon, Richard & Dickey, T. O. (1986). Frontal lobe disinhibition in attention deficit disorder. Child Psychiatry and Human Development, 16, 221-234.

Cohen, Morris, Becker, Mary Gail, & Campbell, Rebecca (1990). Journal of School Psychology, 28, 189-202.

Conte, Richard, Kinsbourne, Marcel, Swanson, James, Zirk, Harry, & Samuels, Marilyn (1986). Presentation rate effects on paired associate learning by attention deficit disordered children. Child Development, 57, 681-687.

Dalby, Thomas J., Kinsbourne, Marcel & Swanson, James M. (1989). Self-paced learning with attention deficit disorder with hyperactivity. Journal of Abnormal Child Psychology, 17, 269-275.

Das, J. P. (1986). Attention Check-list. (Unpublished paper, Developmental Disabilities Center, Univer. of Alberta, Edmonton)

Das, J. P., & Melnyk, Louise (1989). Attention Checklist: a rating scale for mildly mentally handicapped adolescents. Psychological Reports, 64, 1267-1274.

Das, J. P., Mensink, David, & Mishra, R. K. (1990). Cognitive processes separating good and poor readers when IQ is covaried. Learning and Individual Differences, 2, 423-436.

Das, J. P., Mishra, R. K. & Kirby, J. R. (1990). Cognitive patterns of dyslexics: Comparison between groups with high and average nonverbal intelligence. Journal of Learning Disabilities, , .

Das, J. P., & Naglieri, J. A. (1992). Assessment of attention, simultaneous-successive coding, and planning. In H. C. Haywood & D. Tzuriel (Eds.), Interactive Assessment (pp. 207-232). New York: Springer.

Das, J. P., & Naglieri, J. A. (1989). Cognitive Assessment System Exptl. Edition. New York: The Psychological Corporation, Harcourt Brace Jovanovich, Inc.

Das, J. P., Snyder, Thomas J., & Mishra, R. K. (1992). Assessment of attention: Teachers' rating scales and

measures of selective attention. Journal of Psychoeducational Assessment, 10, 37-46.

Douglas, Virginia I. & Benezra, Esther (1990). Supraspan verbal memory in attention deficit disorder with hyperactivity normal and reading disabled boys. Journal of Abnormal Child Psychology, 18,617-638.

Fagan, J. (1991, October). Attention Deficit Disorder. Paper presented at workshop sponsored by Horizon Educational Resource Center, St. Albert, Alberta, Canada.

Fehlings, Darcy L., Roberts, Wendy, Humphries, Tom, & Dawe, Gigi (1991). Attention Deficit Hyperactivity Disorder: Does cognitive behavioral therapy improve home behavior? Developmental and Behavioral Pediatrics, 12, 223-228.

Gordon, Michael (1979). The assessment of impulsivity and mediating behaviors in hyperactive and nonhyperactive boys. Journal of Abnormal Child Psychology, 7, 317-326.

Gordon, Michael (1986). Microprocessor-based assessment of Attention Deficit Disorders (ADD). Psychopharmacology Bulletin, 22, 288-290.

Grant, Mitzie L., Ilai, Doron, Nussbaum, Nancy L., & Bigler, Erin D. (1990). The relationship between continuous performance tasks and neuropsychological tests in children with Attention-Deficit Hyperactivity Disorder. Perceptual and Motor Skills, 70, 435-445.

Gorenstein, Ethan E., Mammato, Cindy A., & Sandy, James M. (1989). Performance of inattentive-overactive children on selected measures of prefrontal-type function. Journal of Clinical Psychology, 45, 619-631.

Gualtieri, C. Thomas, Keenan, P. A., & Chandler, Mark (1991). linical and neuropsychological effects of desipramine in children with attention deficit hyperactivity disorder. Journal of Clinical Psychopharmacology, 11, 155-159.

Guevremont, David C., DuPaul, George J. & Barkley, Russell A. (1990). Diagnosis and assessment of attention deficit-hyperactivity disorder in children. Journal of School Psychology, 28, 51-78.

Halperin, Jeffery M., Newcorn, Jeffery H., Sharma, Vanshdeep, Healey, Jane M., Wolf, Lorraine E., Pascualvaca, Daisy M., & Schwartz, Susan (1990). Inattentive and noninattentive ADHD children: do they constitute a unitary group? Journal of Abnormal Child Psychology, 18, 437-449.

Hynd, George W., Semrud-Clikeman, Margaret, Lorys, Alison R. Novey, Edward S., & Eliopulos, Deborah (1990). Brain morphology in developmental dyslexia and attention deficit disorder/hyperactivity. Archives of Neurology, 47, 919-926.

Hynd, George W., Nieves, Naomi, Connor, Robert T., Stone Penny, Town, Patricia, Becker, Mary Gail, Lahey, Benjamin B., & Lorys, Alison R. (1989). Attention deficit disorder with and without hyperactivity: Reaction time and speed of cognitive

processing. Journal of Learning Disabilities, 22, 573-580.

Irwin, Martin, & Mettelman, Barbara Bilinski (1989). Pitfalls of the continuous performance test. Journal Of Developmental and Behavioral Pediatrics, 10, 284-285.

Jacobvitz, Deborah, Sroufe, L. Alan, Stewart, Mark, & Leffert, Nancy (1989). Treatment of attentional and hyperactivity problems in children with sympathomimetic drugs: A comprehensive review. Journal of the American Academy of Child and Adolescent Psychiatry, 29, 677-686.

Keith, Robert W., & Engineer, Parika (1991). Effects of methylphenidate on the auditory processing abilities of children with Attention Deficit-Hyperactivity Disorder. Journal of Learning Disabilities, 24, 630-636.

Kirby, J. R., & Das, J. P. (1990). A cognitive approach to intelligence: Attention, coding and planning. Canadian Psychology, 31, 320-331.

Klee, Steven H. (1986). The clinical Psychological evaluation of attention deficit disorder. Psychiatric Annals, 16, 43-46.

Kupietz, Samuel S. (1990). Sustained attention in normal and reading-disabled youngsters with and without ADDH. Journal of Abnormal Child Psychology, 18, 357-372.

Lahey, Benjamin B., McBurnett, Keith, Piacentini, John C., Hartdagen, Sandra, Walker, Jason, Frick, Paul J., & Hynd, George W. (1987). Agreement of parent and teacher rating scales with comprehensive clinical assessments of attention deficit disorder with hyperactivity. Journal of Psychopathology and Behavioral Assessment, 9, 429-439.

Lahey, Benjamin B., Schaughency, Elizabeth A., Hynd, George W., Carlson, Caryn L. & Nieves, Naomi (1987). Attention deficit disorder with and without hyperactivity: Comparison of behavioral characteristics of clinic referred children. Journal

of American Academy of Child and Adolescent Psychiatry, 26, 718-723.

Lam, Chee M., & Beale, Ivan L. (1989). Relationship between the delay task and rating scale measures of inattention and hyperactivity. Journal of Abnormal Child Psychology, 17, 625-631.

Loge, Dawn V., Staton, R. Dennis, & Beatty, William W. (1990). Performance of children with ADHD on tests sensitive to frontal lobe dysfunction. Journal of the American Academy of Child and Adolescent Psychiatry, 29, 540-545.

Lorys, Alison R., Hynd, George W., & Lahey, Benjamin B. (1990). Do neurocognitive measures differientiate attention deficit disorder (add) with and without hyperactivity? Archives of Clinical Neuropsychology, 5, 119-135.

Lufi, Dubi, Cohen, Arie, & Parish-Plass, Jim (1990). Identifying Attention Deficit Hyperactive Disorder with the WISC-R and the Stroop Color and Word Test. Psychology in the Schools, 27, 28-34.

Marturano, Edna Maria (1986). Classroom behaviors related to academic gains in a group of low achieving children. Child Psychiatry and Human Development, 18, 22-36.

Meents, Cassandra K. (1989). Attention Deficit Disorder: A review of the literature. Psychology in the Schools, 26, 168-177.

Melnyk, L. J. (1988). The measurement of attention deficits in mildly mentally handicapped adolescents. Unpublished master's thesis, University of Alberta, Edmonton, Alberta.

Melnyk, L., & Das, J. P. (1992). Measurement of attention deficit: Correspondence between rating scales and tests of sustained and selective attention. American Journal on Mental Retardation, 96, 559-606.

Mettelman, Barbara Bilinski (1988). The assessment of attention: I. Standardization and reliability of a

behavior-based measure. Journal of Clinical Psychology, 44, 682-690.

Milich, Richard, Licht, Barbara G., Murphy, Debra A., & Pelham, William E. (1989). Attention-deficit hyperactivity disordered boys' evaluations of and attributions for task performance on medication versus placebo. Journal of Abnormal Psychology, 98, 280-284.

Moghadam, H. (1988). Attention Deficit Disorder Hyperactivity Revisited. Calgary, Alberta: Detselig Enterprises Ltd.

Naglieri, J. A., & Das, J. P. (1986). Planning-arousal-simultaneous-successive (PASS): A model for assessment. The Journal of School Psychology, 26, 35-48.

Naglieri, J. A., & Das, J. P. (1987). Construct and criterion-related validity of planning, simultaneous, and successive cognitive processing tasks. Journal of Psychoeducational Assessment, 4, 353-363.

Naglieri, J. A., & Das, J. P. (1990). Planning, attention, simultaneous and successive (PASS) cognitive processes as a model for intelligence. Journal of Psychoeducational Assessment, 8, 303-337.

Naglieri, J. A., Das, J. P., & Jarman, R. F. (1990). Planning, attention, simultaneous and successive cognitive processes as a model for assessment. School Psychology Review, 19, 423-442.

Naglieri, J. A., Das, J. P., Stevens, J. J., and Ledbetter, M. F. (1991). Confirmatory factor analysis of planning, attention, simultaneous, and successive cognitive processing tasks. The Journal of School Psychology, 29, 1-17.

Naglieri, Jack A. (1989). Planning, attention, simultaneous, and successive cognitive processes: a summary of recent studies with exceptional samples. The Mental Retardation and Learning Disability Bulletin, 17, 3-22.

Newcorn, Jeffrey H., Halperin, Jeffrey M., Healey, Jane M., O'Brien, John D., Pascualvaca, Daisy M., Wolf, Lorraine E., Morganstein, Allen, Sharma, Vansdeep, & Young, J. Gerald (1989). Are ADDH and ADHD the same or different? Journal of the American Academy of Child and Adolescent Psychiatry, 28, 734-738.

Pisterman, Susan, McGrath, Patrick, Firestone, Phillip, Goodman, John T., Webster, Ikuko, & Mallory, Risa (1989). Outcome of parent-mediated treatment of preschoolers with attention deficit disorder with hyperactivity. Journal of Counsulting and Clinical Psychology, 57, 628-635.

Posner, M. I., & Boies, S. J. (1971). Components of attention. Psychological Review, 78, 391-408.

Reeve, Ronald E. (1990). ADHD: Facts and Fallacies. Intervention in School and Clinic, 26(2), 70-77.

Schachar, Russell, & Logan, Gordon D. (1990). Are hyperactive children deficient in attentional capacity? Journal of Abnormal Child Psychology, 18, 493-513.

Schaughency, Elizabeth A., Lahey, Benjamin B., Hynd, George W., Stone, Penny A., Piacentini, John C., & Frick Paul J. (1989). Neuropsychological test performance and the attention deficit disorders: Clinical utility of the Luria-Nebraska Neuropsychological Battery- Children's Revision. Journal of Consulting and Clinical Psychology, 57, 112-116.

Seidel, William T. & Joschko, Michael (1990). Evidence of difficulties in sustained attention in children with ADHD. Journal of Abnormal Child Psychology, 18, 217-229.

Silver, Larry B. (1990). Attention deficit-hyperactivity disorder: is it a learning disability or a related disorder? Journal of Learning Disabilities, 23, 394-397.

Solanto, Mary V., & Wender, Esther H. (1989). Does Methylphenidate constrict cognitive functioning? Journal of the American Academy of Child and Adolescent Psychiatry, 28, 897-902.

Strayhorn, Joseph, M., & Weidman, Carla S. (1989). Reduction of attention deficit and internalizing symptoms in preschoolers through paretn-child interaction training. Journal of the American Academy of Child and Adolescent Psychiatry, 28, 888-896.

Swanson, James M. Cantwell, Dennis, Lerner, Macr, McBurnett, Keith & Hanna, Greg (1991). Effects of stimulant medication on learning in children with ADHD. Journal of Learning Disabilities, 24, 219-230.

van der Meere, Jaap, & Sergeant, Joseph (1988). Focused attention in pervasively hyperactive children. Journal of Abnormal Child Psychology, 16, 627-639.

Whalen, Carol K. & Henker, Barbara (1991a). Social impact of stimulant treatment for hyperactive children. Journal of Learning Disabilities, 24, 231-241.

Whalen, Carol K., & Henker, Barbara (1991b). Therapies for hyperactive children: Comparisons, combinations,

and comprimises. Journal of Consulting and Clinical Psychology, 59, 126-137.

Whalen, Carol K. & Henker, Barbara (1985). The social worlds of hyperactive (addh) children. Clinical Psychology Review, 5, 447-476.

Zelko, Frank A. J. (1991). Comparison of parent-completed behavior rating scales: differentiating boys with ADD from psychiatric and normal controls. Developmental and Behavioral Pediatrics, 12, 31-38.

Zentall, Sydney S., & Meyer, Martha J. (1987). Self-regulation of stimulation for DADD-H children during reading and vigilance task performance. Journal of Abnormal Child Psychology, 15, 519-536.

PAGES 143-146 INCLUSIVE HAVE BEEN REMOVED DUE TO COPYRIGHT RESTRICTIONS

APPENDIX A - ATTENTION CHECKLIST WITH KEY

APPENDIX B - EXPRESSIVE ATTENTION

APPENDIX C - RECEPTION ATTENTION

APPENDIX D - VISUAL SELECTIVE ATTENTION

SOURCE: DR. J.P. DAS, PROFESSOR OF EDUCATIONAL PSYCHOLOGY
UNIVERSITY OF ALBERTA